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CATALOGUES

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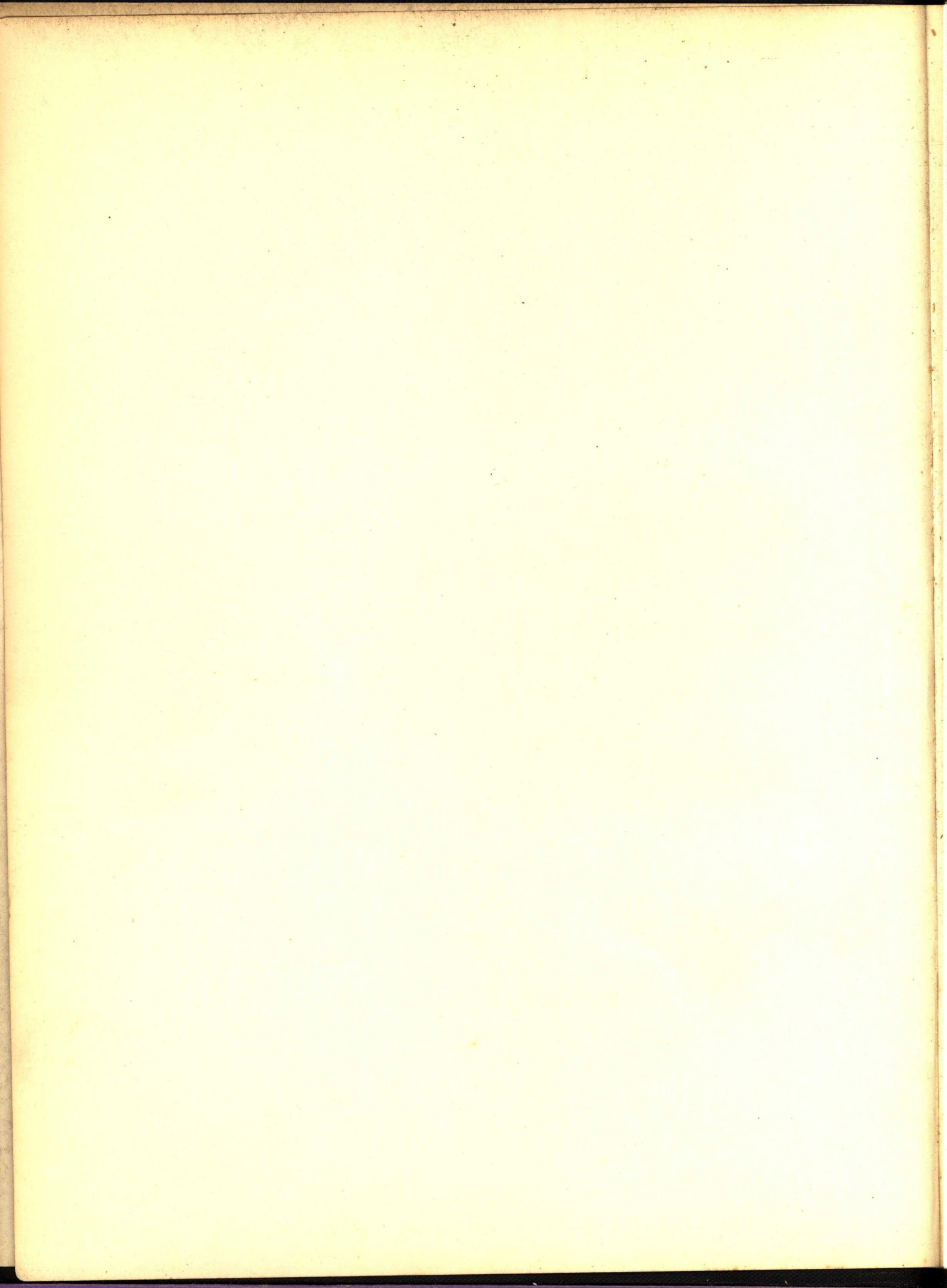
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SWEET'S ENGINEERING CATALOGUES

A List of Manufacturers Catalogues of

INDUSTRIAL MILLING MACHINERY

POWER PLANT EQUIPMENT

HEATING AND VENTILATING EQUIPMENT

FACTORY FURNITURE

FOR THE YEAR

1933

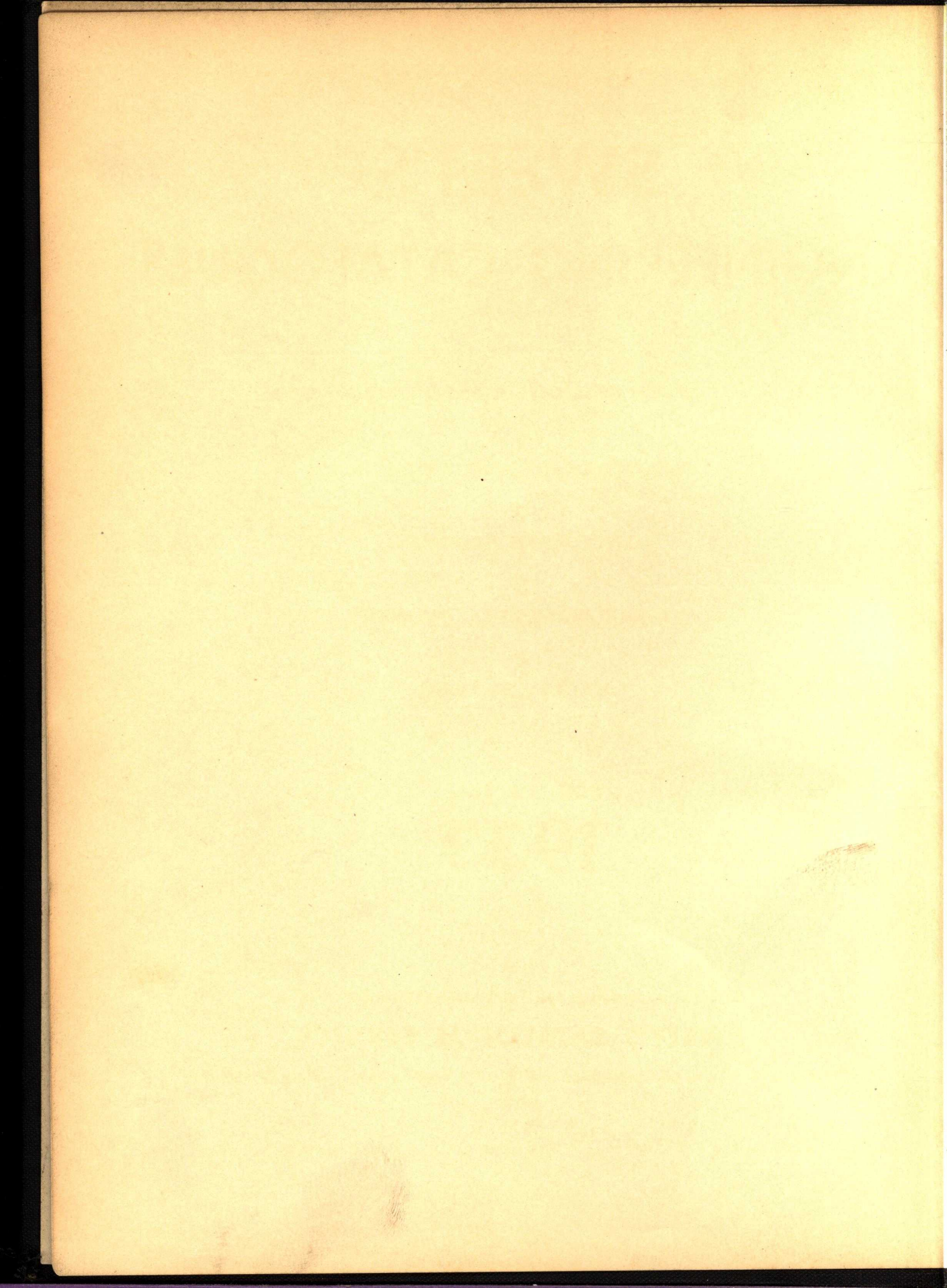
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SWEET'S ENGINEERING CATALOGUES

(Reg. U. S. Pat. Off.)

A File of Manufacturers' Catalogues of

• 1 •

INDUSTRIAL BUILDING PRODUCTS

• 2 •

POWER PLANT EQUIPMENT

• 3 •

MATERIAL HANDLING EQUIPMENT

• 4 •

FACTORY EQUIPMENT

FOR THE YEAR

1933

Edited, Classified, Indexed, Published and Distributed by

SWEET'S CATALOGUE SERVICE

Division of F. W. Dodge Corporation



119 West Fortieth St., New York, N. Y.

SWEET'S CATALOGUE SERVICE

- *saves your time* •
- *eliminates catalogue waste* •
- *reduces manufacturers' costs per order* •

THE assembling of catalogue information on products under consideration for purchase has, in the past, required considerable of the prospective buyer's time and no little inconvenience. This was due mainly to the difficulty of maintaining an adequate file of manufacturers' catalogues—a file comprehensive enough to include catalogues on a wide variety of products and one which would yield the information desired with a minimum of time and effort.

Experience has shown that the trouble is centered in the form in which catalogues are distributed. Individually distributed, they require individual handling—reviewing, sorting, classifying, indexing, filing and periodic replacement. In nearly all offices time, if nothing else, does not permit attention to all these operations which are essential to a really useful file.

SWEET'S CATALOGUE SERVICE evolved the plan under which catalogues are conveyed to prospective buyers in a complete file, classified and indexed in advance, thus relieving both buyer and seller of the money wasting and time consuming operations which were inseparably tied up with individually distributed catalogues. In the SWEET'S file, any catalogue can be located instantly whenever wanted—there is no possibility of its having been lost, misfiled or thrown away. Moreover, all catalogues filed in SWEET'S are revised up-to-date with each succeeding edition, thus avoiding the possibility of wasting time on obsolete information.

The usefulness of any catalogue file depends on the number of up-to-date catalogues it contains, on the accuracy and completeness of the catalogues filed and the certainty and ease of finding any particular catalogue desired. The catalogue information contained in this edition, although equivalent to the contents of some four hundred catalogues, booklets and bulletins, is only a part of the total which it is hoped will soon be available.

In your own interest, and that of over 15,000 other users of SWEET'S, therefore, you are urged to mention SWEET'S as the source when you select or specify from catalogues included herein and to comment on the omissions when you have been put to the inconvenience of requesting information which, to the manufacturers' advantage as well as yours, might have been included in their catalogues in SWEET'S.

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American Meter Co., Inc.	500
<i>Copes</i>	415
Fisher Governor Co.	410
Foxboro Co.	517
<i>Infilco</i>	280
Swartwout Co.	417
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<i>L&N</i>	520
Leeds & Northrup Co.	520

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Cutler-Hammer, Inc.	538
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<i>Copes</i>	415
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Foxboro Co.	517
Keckley, O. C., Co.	412
Mason-Neilan Regulator Co.	521
Powers Regulator Co.	299
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<i>Wizard</i>	410
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<i>Infilco</i>	280
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Mason-Neilan Regulator Co.	521
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Brown Instrument Co.	513
<i>Controlograph</i>	510
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Foxboro Co.	517
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Powers Regulator Co.	299
<i>R-K</i>	416
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<i>G-W</i>	608
<i>Monarch</i>	612
<i>Rex</i>	606
<i>S-A</i>	613
Stephens-Adamson Mfg. Co.	613
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<i>Stearns High Duty</i>	700

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Belt Idlers for—Troughing or Flat

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Chain Belt Co.	606
<i>Monarch</i>	612
<i>Rex-Stearns</i>	606
<i>S-A</i>	613
Sprout, Waldron & Co., Inc.	612
Stephens-Adamson Mfg. Co.	613

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Cable—Monorail

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American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Co.....	510
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Morey & Jones, Ltd.	506
Pneumercator Co., Inc.	529
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American Meter Co., Inc.	500
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Co.	510
Ashcroft American Gauge Division, Consolidated Ashcroft Hancock Co.	512
"Ashcroft American"	512
Bailey Meter Co.	502
Bristol Co.	514
Brown Instrument Co.	513
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American Meter Co., Inc.	500
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Co.	510
Bailey Meter Co.	502
Bristol Co.	514
Brown Instrument Co.	513
Crosby Steam Gauge & Valve Co.	516
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(Including: Bevel, Herringbone, Miter, Spur, Worm and Helical)	
IXL	644
Jones, W. A., Foundry and Machine Co.	646
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Jones, W. A., Foundry and Machine Co.	646
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Philadelphia Gear Works.	647
Philweld	647
Terry Steam Turbine Co.	480
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Boston Gear Works Inc.	640
Earle Gear & Machine Co.	642
Earleweld	642
Philadelphia Gear Works.	647
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Fairbanks, Morse & Co.	477
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Allis-Chalmers Mfg. Co.	532
Westinghouse Electric & Mfg. Co.	542
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Allis-Chalmers Mfg. Co.	532
Troy-Engberg	475
Troy Engine & Machine Co.	475
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Allis-Chalmers Mfg. Co.	532
Carling Turbine Blower Co.	302
Moore Steam Turbine Corp.	479
Terry Steam Turbine Co.	480
Westinghouse Electric & Mfg. Co.	340
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Allis-Chalmers Mfg. Co.	532
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Carbon Oxide and Nitrogen Gas

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Artex	240
Aurora	240
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Factrolite	240
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Mississippi Glass Co.	240
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Factrolite	240
Magnalite—A	240
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Calbar Paint & Varnish Co.	241
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Tropical Paint & Oil Co.	247

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Anode	653
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Constant Pressure Pump

Fisher Governor Co.	410
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Atlas Valve Co.	406
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Fulton	407
Ideal	406
Northern Equipment Co.	415
S-C	417
Kieley & Mueller, Inc.	413
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Atlas Valve Co.	406
Copes	415
Ideal	406
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Pittsburgh-Des Moines Steel Co.	273
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Babcock & Wilcox Co.	320
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Shaking and Dumping

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Black & Decker Mfg. Co.	712
Van Dorn Electric Tool Co.	715

Portable—Electric

Black & Decker Mfg. Co.	712
Van Dorn Electric Tool Co.	715

Grinding Mills

Attrition

Stephens-Adamson Mfg. Co.	613
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Cereal

Monarch	612
S-A	613
Sprout, Waldron & Co., Inc.	612
Stephens-Adamson Mfg. Co.	613
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Ground Resistance Testers

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(See also Guards)

Consolidated Expanded Metal Cos.	150
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Guards

Clock, Gongs, Bells, etc.

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Consolidated Expanded Metal Cos.	150
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Black & Decker Mfg. Co.	712
Van Dorn Electric Tool Co.	715

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Schram, Inc.	429
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Door—Straight Sliding

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Grinnell Co., Inc.	388
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Including: Universal, Plain, Ball or Roller Bearing, Ring Oiling, Bracket, Post, etc. (See also Hanger Boxes.)

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SKF Industries, Inc.	637
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Cement and Concrete

Master Builders Co.	122
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Concrete and Asphalt Floors

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Henszey De-Concentrator Co.	333
G-R	369
Griscom-Russell Co.	369
Multiwhirl	369
National Pipe Bending Co.	371
Reilly	369
Schutte & Koerting Co.	372
SK	372
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Vaneflo	369
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Condenser Service & Engineering Co., Inc.	357
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Chromalox	702
Westinghouse Electric & Mfg. Co.	701
Wiegand, Edwin L., Co.	702

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Air Preheater Corp.	356
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Air—Electric

Chromalox	702
Heetflo	702
Westinghouse Electric & Mfg. Co.	701
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See Heaters—Unit

Air—Steam—Pipe Coil

See Heating and Ventilating Units Combined; Heaters—Unit

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Hauck Mfg. Co.	705
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Cartridge

Chromalox	702
Westinghouse Electric & Mfg. Co.	701
Wiegand, Edwin L., Co.	702

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Hauck Mfg. Co.	705
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Griscom-Russell Co.	369
National Pipe Bending Co.	371
Reilly	369
Schutte & Koerting Co.	372
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Anthony Company, The	704
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Chromalox	702
Cutler-Hammer, Inc.	538
Westinghouse Electric & Mfg. Co.	701
Wiegand, Edwin L., Co.	702
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Indirect

See Heaters—Water Indirect

Rivet, Gas or Oil

Anthony Company, The	704
Hauck Mfg. Co.	705

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Chromalox	702
Wiegand, Edwin L., Co.	702

Unit

(Units comprising a radiating surface over which air is forced by a fan)

(See also Heating and Ventilating Units, Combined; Radiators—Steam or Hot Water—Concealed)

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Autovent Fan & Blower Co.	301
Breezeo-Fin	295
Buffalo Forge Co.	295
Chromalox	702
Clarage Fan Co.	306
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Grinnell Co., Inc.	296
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<i>Unitherm</i>	306
<i>Venturafin</i>	300
Wiegand, Edwin L., Co.	702
Wing, L. J., Mfg. Co.	297

Unit—Gas Fired

Buffalo Forge Co.	295
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Vulcanizer

Westinghouse Electric & Mfg. Co.	701
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See Vulcanizers

Water—Coal Fired—Tank or Boiler

Burnham Boiler Corp.	294
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Water—Electric

<i>Chromalox</i>	702
Wiegand, Edwin L., Co.	702
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Water—Indirect or Direct—Instantaneous or Non-storage

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<i>G-R</i>	369
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Burnham Boiler Corp.	294
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Wells-Titusville Corp.	329
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Electrical

<i>Chromalox</i>	702
Westinghouse Electric & Mfg. Co.	701
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See Gas Heating Equipment

Heating and Ventilating

Apparatus

See Specific Item, as: Heaters, Heating Systems, Fans, Blowers, Ventilators, etc.

Units Combined

<i>Parko</i>	307
Parks-Cramer Co.	307

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Anthony Company, The.	704
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Energy Elevator Co.	593
Payne, F. S., Co.	592

Ash, Telescopic—Electric

<i>G&G</i>	594
Gillis & Geoghegan, Inc.	594

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<i>G&G</i>	594
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<i>Blue Boy</i>	614
<i>C-M</i>	614
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SWEET'S ENGINEERING CATALOGUES

SECTION 1

BUILDING SERVICES AND PRODUCTS

ENGINEERING & CONTRACTOR SERVICES
...
EQUIPMENT & SUPPLIES

HAMILTON MANUFACTURING CO.

Manufacturers of Drafting Room Furniture

GENERAL SALES OFFICE AND FACTORY
TWO RIVERS, WIS.

RAHWAY, N. J.

CHICAGO, ILL.

LOS ANGELES, CALIF.

Hamilton Products

OAK and STEEL SECTIONAL PLAN FILE CABINETS; ADJUSTABLE DRAWING TABLES; DRAWING BOARDS.

Also Collapsible Drawing Tables and Easels, Parallel Rule Attachments, Artists' Tables, Typewriter Tables, School Tables, etc.

Literature

Further information on Hamilton Drafting Room Furniture and Hamilton-Calumet Plan File System is available. *Ask for Catalogue No. 10-S.*

HAMILTON FILING CABINETS

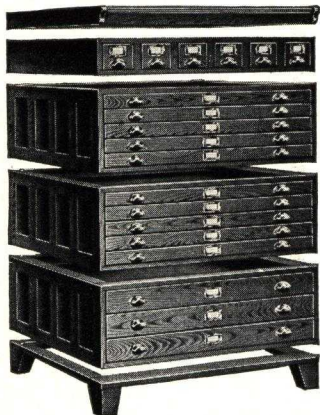
Hamilton Oak Plan File Units

These units are thoroughly well made of seasoned oak and well finished.

They are made for drawings 24x36, 30x42 and 36x48 in. Special sizes can be made to order.

Bases are supplied in four different styles; flush to the floor or on legs, sanitary style.

Ask for Catalogue No. 10-S.



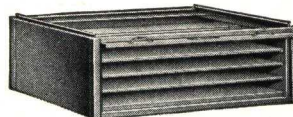
Oak Plan File Cabinet Units, Combination 29



Steel Shallow Drawer Unit



Steel 5-drawer Unit



Steel Shelf-filing Unit

Hamilton-Calumet Steel Plan File Units

Made for sheets from 24x36 to 42x72 in.

Shallow Drawer Units—The shallow drawer units are for active tracings. The semi-mechanical lifter eliminates wear and tear. This feature permits active tracings to be filed rapidly and efficiently.

5-Drawer Unit—The 5-drawer unit is for semiactive tracings in folders; 4 folders of 50 sheets to a drawer.

Shelf-filing Units—The shelf-filing units are for storage of inactive plans; 4 folders of 50 sheets to a shelf.

Ask for Catalogue No. 10-S.

Hamilton-Calumet Steel Vertical Plan File

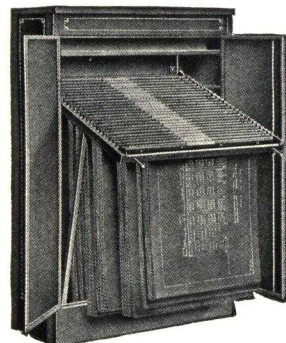
A vertical file for the most efficient handling of large records or sets of plans.

The sheets are held in binders, 26 binders of 100 tracings each to a cabinet.

Made for plans from 24x70 to 48x70 in.

Made of steel, olive green finish.

Ask for Catalogue No. 10-S.



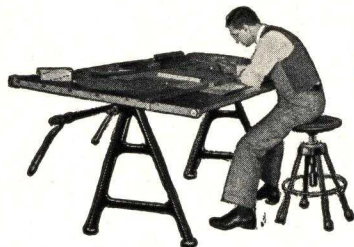
Hamilton-Calumet Steel Vertical Plan File

HAMILTON TABLES AND BOARDS

Hamilton-Smith Drawing Table, Reference Table, and Stool

A new self-leveling table. Very rigid. Made 36x60 to 42x84 in. Adjustable in height or slant by a simple device. To be used with stool shown and Smith Reference Table.

Ask for Catalogue No. 10-S.



Hamilton-Smith Drawing Table and Stool

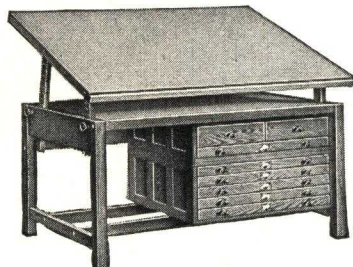
Hamilton Adjustable 4-Post Drawing Table

The pine top is adjustable in height and slant. Any drawer combination can be supplied. They are made from 36x60 to 42x84 in.

Ask for Catalogue No. 10-S.



Hamilton Steel Base Drawing Table, No. 214



Hamilton 4-post Drawing Table

Nos. 142, 145, 149, 150, 154 and 155

Hamilton Steel Base Adjustable Drawing Table

This table has an unbreakable steel base, with pine top; in sizes from 36x48 to 48x120 in., and is made with or without the swing tray.

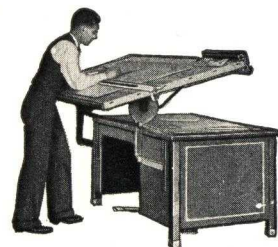
The top is easily adjustable in height by a new screw device.

Ask for Catalogue No. 10-S.

Hamilton Auto-shift Drawing and Reference Table

A new table with an absolutely unique mechanism for adjusting the top to any height or slant. Any adjustment desired in three seconds. Body of steel, olive green. Made with tops 36x60 to 42x84 in.

Ask for Circular 47-S and Catalogue No. 10-S.



Auto-shift Drawing and Reference Table

Hamilton Ideal-Universal Adjustable Drawing Table

The pine top is adjustable in height and slant as well as vertically. Top also slides forward or back 25 in., making the table adaptable to any kind of drafting or art work.

Ask for Catalogue No. 10-S.



Hamilton Ideal-Universal Drawing Table

Hamilton Drawing Boards

Made in pine or basswood in seven styles and in any size from 10x12 to 48x96 in. Special sizes made on order.



Style A Drawing Board

WICKES BROTHERS

ESTABLISHED 1856

SAGINAW, MICH.

SALES OFFICES

NEW YORK, N. Y., 501 Fifth Avenue

SEATTLE, WASH., 1910 East 50th Street

Products

WICKES CONTINUOUS ELECTRIC BLUE PRINTING MACHINES. Also builders of Standard Heavy Duty Engine Lathes, Crankshaft Lathes, Production Lathes, Heavy Duty Punches (vertical and horizontal), Shears (plate, bar, structural), Bending Rolls (horizontal, vertical, and angle), Radial Wall Drills, Flanging Clamps.

Wickes Blue Printing Machines

Advantages—Prints made with the Wickes Blue Printing Machine are absolutely uniform in tone throughout and lines are sharp and clear. All work is done in broad daylight. There is no glass cylinder to clean, break or replace. Simple in operation. We claim it will outprint any other machine per unit of electricity consumed.



Wickes Continuous Electric Blue Printing Machine

Operation—The Wickes continuous electric blue printing machine will print separately cut sheets or continuous rolls in any length and in widths varying from 2 to 48 in. The paper and tracing, placed on a continuous traveling belt, are carried to the feed roller and around the printing cylinder in which is mounted the lighting element. The printed paper is then delivered to a light-tight storage compartment and the tracing is returned to the operator or carried to the storage compartment, as desired.

The machine is entirely automatic, the only work required of the operator being the placing of the tracing and blue print paper on the traveling belt. The entire op-

erating mechanism is controlled by three toggle switches conveniently located for the operator. The operator without changing position, can start, stop, reverse, or vary speed of drive. The entire electrical mechanism is approved by the National Board of Fire Underwriters.

Continuous Traveling Belt—The contact between tracing and paper is secured by means of a single, wide, continuous belt which passes around the feed rolls and the metallic printing cylinder. The tension of this belt is regulated automatically. Its life is guaranteed for three years' service.

Lighting Element—The light is obtained from one or two mercury vapor lamps of standard pattern. These lamps operate at a very low temperature and require absolutely no attention from the operator at any time.

Model 20 Blue Printing Machine

The Model 20 machine, carrying two lighting elements on separate starting apparatus, has a liberal capacity. With the improved variable speed, 4-step, quick change gear box and adjustment of motor on iron driving disc, the printing speed can be adjusted to suit any grade of paper, including VanDyke's. The machine is entirely self-contained; is 30 in. high and requires a floor space of 2 ft. 6 in. x 5 ft.

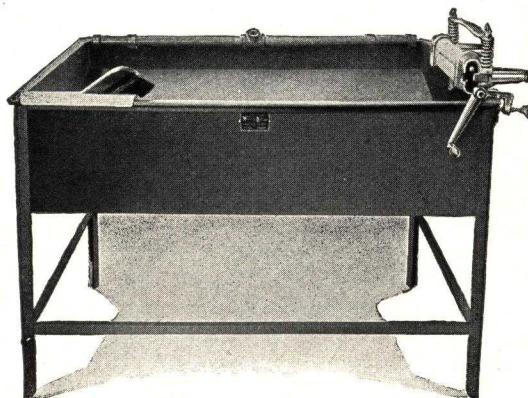
Model 15 Blue Printing Machine

The Model 15 machine is constructed exactly like the Model 20, except that it carries only one lighting element, decreasing the printing speed about one-half. It is so constructed that another lighting element can be added at any time as required, thus changing it to a Model 20 machine.

Wickes Washer

The Wickes Horizontal Blue Print Washer is extremely durable, and is a great convenience in the drafting room as it affords a means of washing prints speedily and without muss and bother. The washing tank, 36x48 in. in size, is constructed of strong sheet metal on angle iron legs, with sufficient slant

so water will run rapidly from prints being washed. A pipe with a gang of holes to give spray effect is mounted on the back. The chemical tray with brush is in front and the wringer is attached to the side—all within easy reach of the operator.

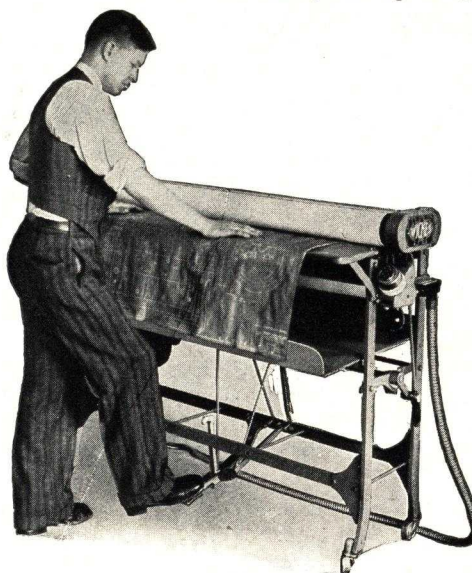


Wickes Horizontal Blue Print Washing Tank

Wickes Electric Dryer

This dryer is especially recommended for use in connection with the Wickes Continuous Electric Blue Printing Machine. It will dispense with the old method of hanging prints on racks to dry, thereby doing away with drippings and conserving floor space to a minimum.

A revolving seamless steel cylinder insures a steady, even heat at all times. It will take blue prints up to 46 in. wide,



Wickes Electric Dryer in Operation

unlimited lengths. Prints may be dried continuously without stopping and starting dryer. A wide hard maple feed board leads to the rolls.

It is as nearly automatic as possible. One pressure of the foot lever puts the whole machine in operation. No levers to work; no buttons to push on and off, both hands being always free to handle prints being dried. It has a powerful motor, and operates without noise or vibration. It is sturdily built, the frame being of rigid, indestructible channel iron finished in enamel.

Catalogues

Catalogues fully describing the Wickes Blue Printing Equipment will be sent on request.

JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS

Jones & Laughlin Building, PITTSBURGH, PA.

For Sales Offices and Warehouses, see pages on Tubular Products

Products

J & L STEEL PILING.

Also J & L Structural Shapes and Fabricated Structural Work, Columns, Girders, Trusses, Plate Work, Tanks, Mill and Factory Buildings; J & L Junior Beams; J & L Wire Products.



For J & L Light Weight Channels for Stair Stringers and other uses, J & L Bars for Concrete Reinforcement and J & L Tubular Products, see page numbers in Manufacturers' Index.

DISTINCTIVE FEATURES OF J & L STEEL PILING

Three important economies are introduced in piling project design and construction by use of one or more of the present five J & L Steel Piling Sections, EC-22, EC-23.75, PC-27, EDC-24.6 and DC-25. (Additional sections are being studied. Latest data on new sections, when they are developed, will be furnished upon request.) Savings are effected in cost of material per square foot of wall, in freight charges on long hauls of material and in labor required for installation. They result from the following exclusive features of J & L Steel Piling:

(1) All sections are integrally balanced with neutral axis close to center line of section, enabling them to drive plumb and make distance in wall when driven. (2) All sections have the same universal interlock of like dimensions, which gives three-line contact, affording great strength in tension and watertight-

ness with ample clearance for free driving and pulling, and making practicable combinations of any or all sections over a wide range of weights and properties per square foot of piling wall. (3) Deflection in interlock can be 20° to 30° on either side of the center line, maintaining uniform interlock strength. (4) Interlocks are so designed that they tighten under stress or pressure. (5) All sections are rolled of open hearth steel in restricted analysis, with carbon and other elements arranged to give suitable stiffness, tensile strength of at least 75,000 lbs. per sq. in., and ample toughness to resist upsetting when driven.

All J & L Steel Piling Sections, or combinations of sections, make up an ideal type of wall, of adequate beam strength with considerable saving in weight, for all practical steel piling work, including core wall construction, cofferdams, dock walls, piers, bulkheads, revetments, seawall construction and foundation work.

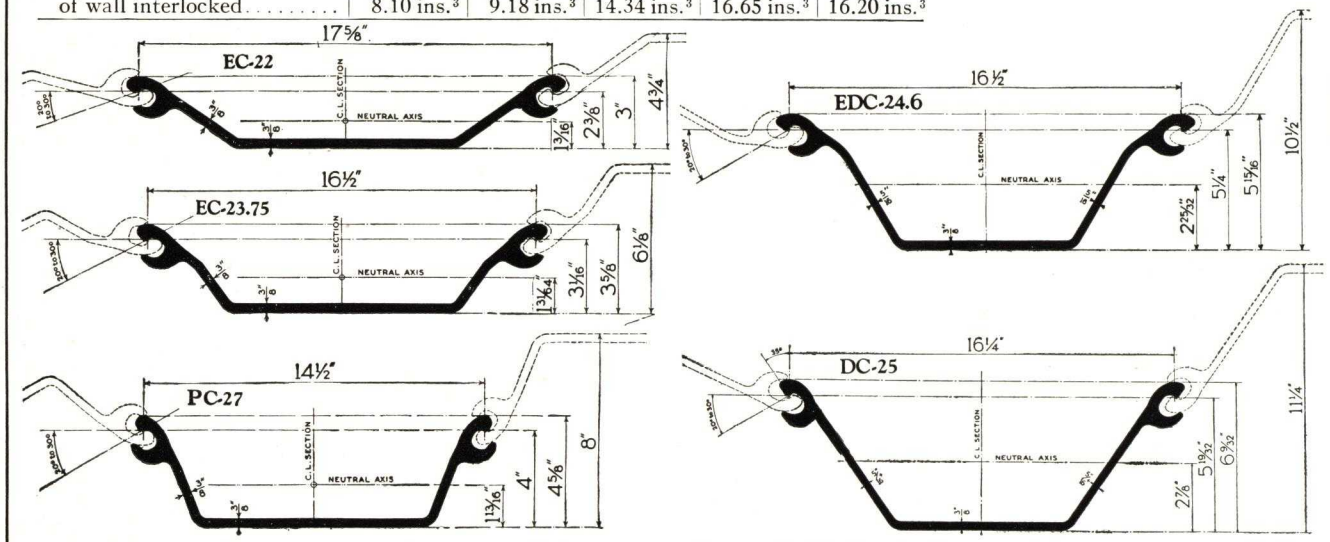
Description and pictures of difficult and important work carried out with J & L Steel Piling Sections will be furnished on request.

PROPERTIES AND SECTION DETAILS OF J & L STEEL PILING

Properties of J & L Steel Piling	EC-22	EC-23.75	PC-27	EDC-24.6	DC-25
Weight of piling bar per lineal foot.....	32.50 lbs.	32.50 lbs.	32.50 lbs.	33.85 lbs.	33.85 lbs.
Weight per square foot of wall.....	22.00 lbs.	23.75 lbs.	27.00 lbs.	24.6 lbs.	25.00 lbs.
Moment of inertia.....	9.42 ins. ⁴	14.42 ins. ⁴	23.19 ins. ⁴	43.75 ins. ⁴	47.21 ins. ⁴
Section modulus of bar.....	5.20 ins. ³	6.53 ins. ³	8.19 ins. ³	14.03 ins. ³	14.02 ins. ³
Section modulus per 12 in. of width.....	3.50 ins. ³	4.75 ins. ³	6.77 ins. ³	10.20 ins. ³	10.35 ins. ³
Radius of gyration.....	.994 in.	1.23 ins.	1.56 ins.	2.11 ins.	2.19 ins.
Thickness of wall.....	4.75 ins.	6.125 ins.	8.00 ins.	10.50 ins.	11.25 ins.
Section modulus interlocked.....	11.96 ins. ³	12.62 ins. ³	17.33 ins. ³	23.05 ins. ³	21.60 ins. ³
Section modulus per lineal foot of wall interlocked.....	8.10 ins. ³	9.18 ins. ³	14.34 ins. ³	16.65 ins. ³	16.20 ins. ³

Note: The section modulus interlocked is shown and may be used with safety when two adjacent sections are welded before driving, or a percentage of this combined strength may be figured when interlocks are packed in hard driving at bottom and bolted or welded at top. Engineering judgment should be exercised on this point for economy.

In driving J & L Steel Piling with webs in line or webs on one side of wall, the section modulus interlocked is the same as that of a single section.



Note: Dimensions and properties of J & L Steel Piling Sections given in these pages are as of May 1, 1933. The JONES & LAUGHLIN STEEL CORPORATION should be consulted for additional detailed information and improvements in above sections and for data on new sections before steel piling projects are designed.

FABRICATED CORNERS

SECTION INDEX	WEIGHT PER FOOT	STANDARD CORNER	NUMBER	STANDARD CORNER	NUMBER	STANDARD CORNER	NUMBER
EC-22	52 lbs.		51		61		71
EC-23.75	52 lbs.		52		62		72
PC-27	52 lbs.		53		63		73
EDC-24.6	54 lbs.		55		65		75
DC-25	54 lbs.		54		64		74

The fabricated corner sections shown in this table are given for type only. Dimensions for all fabricated corners can be readily obtained and computed from piling sections with dimensions shown on the preceding page. Two half-bars of any one

section are used in each case. All standard fabricated corners are punched at both ends for handling and can be driven either end down. If time is important, all standard fabricated sections can be shipped usually in two or three days after receipt of order.

FABRICATED TEES AND CROSSES

SECTION INDEX	WT. PER FOOT OF TEES	STANDARD TEES	NUMBER	STANDARD TEES	NUMBER	STANDARD CROSSES	WT. PER FT. OF CROSSES	NUMBER
EC-22	68 lbs.		82		83		100	92
EC-23.75	68 lbs.		84		85		100	94
PC-27	68 lbs.		86		87		100	96
EDC-24.6	70 lbs.		90		91		102	100
DC-25	70 lbs.		88		89		102	98

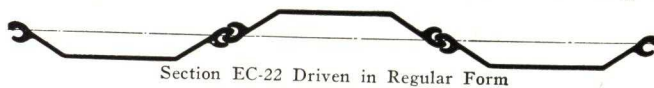
The fabricated sections of tees and cross shown in this table are given for type only. Dimensions for all fabricated tees and crosses can be readily obtained and computed from piling sections with dimensions shown on the preceding page. In the case of tees, one whole and one half-bar of any one section are used, and in the case of crosses, one whole and two

half-bars of any one section are used. Tee piles and crosses will be fabricated as shown, except in the case of crosses in which half-bars may be reversed to secure other details. (A sketch should be submitted with order.) Standard tees and crosses are designed and punched at both ends for handling so that they can be driven either end down.

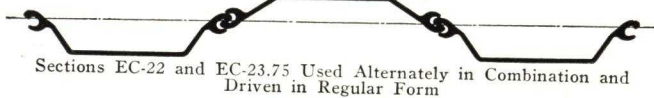
J & L STEEL PILING SECTIONS USED IN COMBINATION

The universal interlock of same dimensions, the feature of all J & L Steel Piling Sections, offers important advantages in all types of piling wall construction. In the same work sections can be changed about without fabrication, and two or more sections can be used in combination without fabrication to give

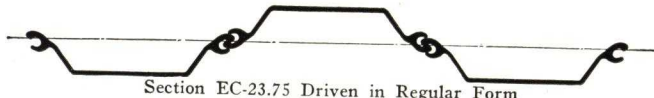
additional strength to portions of the piling wall where pressures and stresses are greatest. The illustrations below show combinations for driving in regular form. For illustrations of sections for driving with webs in line see top of second page following.



Section EC-22 Driven in Regular Form



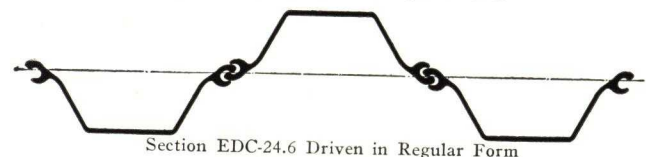
Sections EC-22 and EC-23.75 Used Alternately in Combination and Driven in Regular Form



Section EC-23.75 Driven in Regular Form



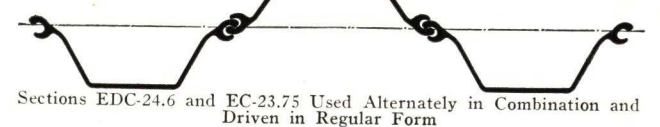
Section PC-27 Driven in Regular Form



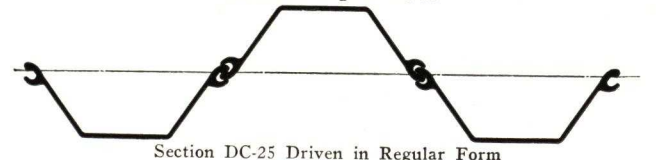
Section EDC-24.6 Driven in Regular Form



Sections EDC-24.6 and EC-22 Used Alternately in Combination and Driven in Regular Form



Sections EDC-24.6 and EC-23.75 Used Alternately in Combination and Driven in Regular Form



Section DC-25 Driven in Regular Form



Sections DC-25 and PC-27 Used Alternately in Combination and Driven in Regular Form

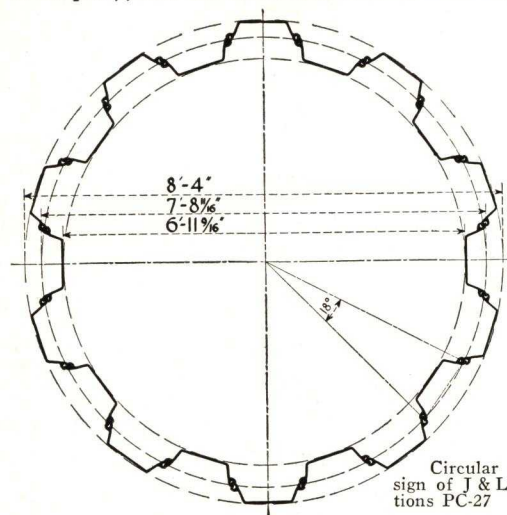
Note: Dimensions and properties of J & L Steel Piling Sections given in these pages are as of May 1, 1933. The JONES & LAUGHLIN STEEL CORPORATION should be consulted for additional detailed information and improvements in above sections and for data on new sections before steel piling projects are designed.

TYPES OF CIRCULAR CONSTRUCTION DESIGN

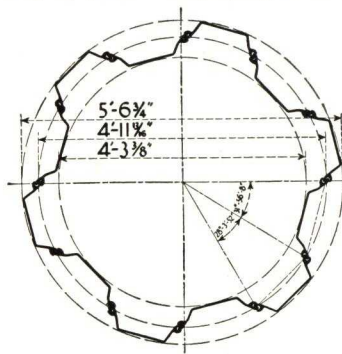
Due to the universal interlock on all J&L Steel Piling Sections (making it possible to use them in various combinations), the constant $\frac{3}{8}$ -in. metal thickness throughout (except in DC-25 and EDC-24.6 which have shank metal thickness of $\frac{1}{2}$ in. plus), and the interlocks at complementary angles, J&L

Steel Piling can be used in circular construction design with great economy.

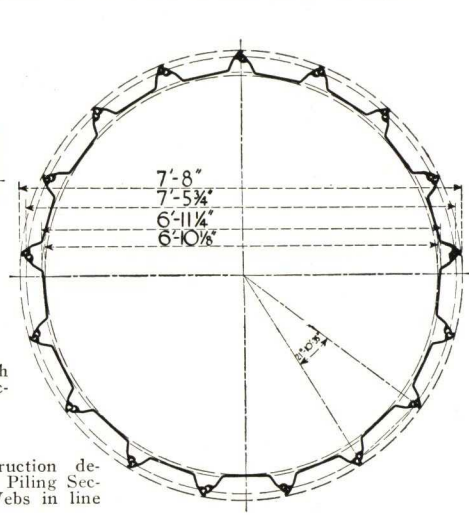
Detail drawings and data given on this page are for three typical designs only. Information on circular construction designs employing other J&L sections will be furnished on request.



Circular construction design of J&L Steel Piling Sections PC-27



Circular construction design with combination of J&L Steel Piling Sections PC-27 and EC-23.75



Circular construction design of J&L Steel Piling Sections EC-23.75. Webs in line

ENGINEERING DATA ON CIRCULAR CONSTRUCTION

	Type of cylinder	Dia. at center line of locks	Outside dia.	Inside dia.	Volume of concrete cu. yds.	Area of concrete sq. ins.	Area of steel sq. ins.	Weight of steel lbs.	Total bearing area sq. ins.
Circular Construction Design using EC-23.75 Sections (Irregular)	17 EC-23.75	7'-5 $\frac{3}{4}$ "	7'-8"	6'-10 $\frac{3}{8}$ "	1.40	5450	162.01	552.5	5612
	18 EC-23.75	7'-11"	8'-1 $\frac{1}{4}$ "	7'-3 $\frac{1}{8}$ "	1.595	6200	171.54	585	6372
	19 EC-23.75	8'-4 $\frac{1}{4}$ "	8'-6 $\frac{1}{2}$ "	7'-8 $\frac{3}{4}$ "	1.788	6950	181.07	617.5	7131
	20 EC-23.75	8'-9 $\frac{1}{2}$ "	8'-11 $\frac{3}{4}$ "	8'-2 $\frac{1}{8}$ "	1.990	7750	190.6	650	7940
	21 EC-23.75	9'-2 $\frac{3}{4}$ "	9'-5"	8'-7 $\frac{3}{8}$ "	2.204	8590	200.13	682.5	8790
	22 EC-23.75	9'-7 $\frac{15}{16}$ "	9'-10 $\frac{3}{8}$ "	9'-0 $\frac{3}{8}$ "	2.440	9500	209.66	715	9710
	23 EC-23.75	10'-1 $\frac{1}{8}$ "	10'-3 $\frac{1}{8}$ "	9'-5 $\frac{15}{16}$ "	2.683	10435	219.19	747.5	10654
	24 EC-23.75	10'-6 $\frac{1}{8}$ "	10'-8 $\frac{1}{8}$ "	9'-11 $\frac{1}{4}$ "	2.941	11420	228.72	780	11649
	25 EC-23.75	10'-11 $\frac{1}{16}$ "	11'-1 $\frac{7}{8}$ "	10'-4 $\frac{3}{8}$ "	3.201	12450	238.25	812.5	12688
	26 EC-23.75	11'-4 $\frac{15}{16}$ "	11'-7 $\frac{1}{8}$ "	10'-9 $\frac{7}{8}$ "	3.480	13510	247.78	845	13758
	27 EC-23.75	11'-10 $\frac{3}{8}$ "	12'-0 $\frac{3}{8}$ "	11'-3 $\frac{3}{8}$ "	3.765	14640	257.31	877.5	14897
	28 EC-23.75	12'-3 $\frac{3}{8}$ "	12'-5 $\frac{3}{8}$ "	11'-8 $\frac{3}{8}$ "	4.075	15850	266.84	910	16117
	29 EC-23.75	12'-8 $\frac{3}{8}$ "	12'-10 $\frac{3}{8}$ "	12'-1 $\frac{3}{8}$ "	4.40	17100	276.37	942.5	17376
	30 EC-23.75	13'-1 $\frac{7}{8}$ "	13'-4 $\frac{1}{8}$ "	12'-6 $\frac{7}{8}$ "	4.833	18800	285.9	975	19086
Circular Construction Design using PC-27 Section	31 EC-23.75	13'-7 $\frac{1}{8}$ "	13'-9 $\frac{1}{8}$ "	13'-0 $\frac{1}{8}$ "	5.03	19550	295.43	1007.5	19845
	32 EC-23.75	14'-0 $\frac{1}{4}$ "	14'-2 $\frac{1}{2}$ "	13'-5 $\frac{1}{8}$ "	5.325	20650	304.96	1040	20955
	33 EC-23.75	14'-5 $\frac{1}{2}$ "	14'-7 $\frac{3}{4}$ "	13'-10 $\frac{3}{8}$ "	5.720	22225	314.49	1072.5	22539
	20 PC-27	7'-8 $\frac{11}{16}$ "	8'-4"	6'-11 $\frac{1}{16}$ "	1.663	6475	190.6	650	6665
	22 PC-27	8'-5 $\frac{7}{8}$ "	9'-1 $\frac{1}{8}$ "	7'-8 $\frac{3}{8}$ "	2.021	7875	209.66	715	8085
	24 PC-27	9'-3 $\frac{1}{8}$ "	9'-10 $\frac{1}{8}$ "	8'-6 $\frac{1}{8}$ "	2.410	9400	228.72	780	9629
	26 PC-27	10'-0 $\frac{1}{8}$ "	10'-7 $\frac{3}{4}$ "	9'-3 $\frac{1}{8}$ "	2.861	11275	247.78	845	11523
	28 PC-27	10'-9 $\frac{1}{8}$ "	11'-5"	10'-0 $\frac{1}{16}$ "	3.305	12850	266.84	910	13117
	30 PC-27	11'-6 $\frac{3}{4}$ "	12'-2 $\frac{1}{4}$ "	10'-10"	3.807	14825	285.9	975	15111
	32 PC-27	12'-3 $\frac{3}{8}$ "	12'-11 $\frac{1}{2}$ "	11'-7 $\frac{1}{4}$ "	4.355	16920	304.96	1040	17225
	34 PC-27	13'-1 $\frac{1}{16}$ "	13'-8 $\frac{3}{4}$ "	12'-4 $\frac{1}{2}$ "	4.915	19100	324.02	1105	19424
	36 PC-27	13'-10 $\frac{1}{4}$ "	14'-6"	13'-1 $\frac{3}{4}$ "	5.502	21450	343.08	1170	21793
	38 PC-27	14'-7 $\frac{1}{2}$ "	15'-3 $\frac{1}{2}$ "	13'-10 $\frac{3}{8}$ "	6.20	24100	362.14	1235	24462
	40 PC-27	15'-4 $\frac{3}{4}$ "	16'-0 $\frac{1}{4}$ "	14'-8"	6.71	26180	381.2	1300	26561
Circular Construction Design using PC-27 & EC-23.75 Sections	42 PC-27	16'-2"	16'-9 $\frac{3}{4}$ "	15'-5 $\frac{3}{4}$ "	7.56	29400	400.26	1365	29800
	44 PC-27	16'-11 $\frac{5}{16}$ "	17'-6 $\frac{7}{8}$ "	16'-3"	8.36	32250	419.32	1430	32669
	46 PC-27	17'-8 $\frac{3}{8}$ "	18'-4 $\frac{1}{8}$ "	17'-0 $\frac{1}{4}$ "	9.04	35100	438.38	1495	35538
	48 PC-27	18'-5 $\frac{3}{4}$ "	19'-1 $\frac{3}{8}$ "	17'-9 $\frac{3}{8}$ "	9.94	38600	457.44	1560	39057
	50 PC-27	19'-2 $\frac{15}{16}$ "	19'-10 $\frac{3}{4}$ "	18'-6 $\frac{1}{2}$ "	10.75	41800	476.5	1625	42276
	52 PC-27	20'-0 $\frac{1}{16}$ "	20'-7 $\frac{15}{16}$ "	19'-3 $\frac{5}{8}$ "	11.61	45250	495.56	1690	45745
	6 PC-27 & 6 EC-23.75	4'-11 $\frac{7}{8}$ "	5'-6 $\frac{13}{16}$ "	4'-3 $\frac{7}{16}$ "	0.682	2650	114.36	390	2764
	7 PC-27 & 7 EC-23.75	5'-9 $\frac{11}{16}$ "	6'-4 $\frac{5}{8}$ "	5'-1 $\frac{1}{2}$ "	0.944	3670	133.42	455	3803
	8 PC-27 & 8 EC-23.75	6'-7 $\frac{1}{16}$ "	7'-2 $\frac{1}{2}$ "	5'-11 $\frac{9}{16}$ "	1.240	4825	152.48	520	4977
	9 PC-27 & 9 EC-23.75	7'-5 $\frac{1}{4}$ "	8'-0 $\frac{3}{8}$ "	6'-9 $\frac{9}{16}$ "	1.575	6125	171.54	585	6296
	10 PC-27 & 10 EC-23.75	8'-3 $\frac{3}{4}$ "	8'-10 $\frac{1}{8}$ "	7'-7 $\frac{3}{4}$ "	1.951	7600	190.6	650	7790
	11 PC-27 & 11 EC-23.75	9'-1 $\frac{1}{4}$ "	9'-8 $\frac{11}{16}$ "	8'-5 $\frac{7}{8}$ "	2.34	9210	209.66	715	9420
	12 PC-27 & 12 EC-23.75	9'-10 $\frac{15}{16}$ "	10'-6 $\frac{7}{16}$ "	9'-3 $\frac{3}{8}$ "	2.762	10800	228.72	780	11009
	13 PC-27 & 13 EC-23.75	10'-8 $\frac{3}{8}$ "	11'-4 $\frac{1}{8}$ "	10'-1 $\frac{1}{8}$ "	3.305	12880	247.78	845	13128
	14 PC-27 & 14 EC-23.75	11'-6 $\frac{1}{8}$ "	12'-2"	10'-11 $\frac{3}{8}$ "	3.860	15000	266.84	910	15267
	15 PC-27 & 15 EC-23.75	12'-4 $\frac{1}{4}$ "	12'-11 $\frac{13}{16}$ "	11'-9 $\frac{1}{4}$ "	4.425	17200	285.9	975	17486
	16 PC-27 & 16 EC-23.75	13'-2 $\frac{1}{8}$ "	13'-9 $\frac{11}{16}$ "	12'-7 $\frac{1}{16}$ "	5.070	19700	304.96	1040	20005
	17 PC-27 & 17 EC-23.75	14'-0"	14'-7 $\frac{3}{8}$ "	13'-5"	5.730	22300	324.02	1105	22624
	18 PC-27 & 18 EC-23.75	14'-9 $\frac{5}{8}$ "	15'-5 $\frac{1}{2}$ "	14'-3"	6.430	25000	343.08	1170	25343
	19 PC-27 & 19 EC-23.75	15'-7 $\frac{11}{16}$ "	16'-3 $\frac{3}{8}$ "	15'-0 $\frac{7}{8}$ "	7.170	27900	362.14	1235	28262
	20 PC-27 & 20 EC-23.75	16'-5 $\frac{1}{2}$ "	17'-1 $\frac{1}{8}$ "	15'-10 $\frac{1}{16}$ "	8.20	31900	381.2	1300	32181
	21 PC-27 & 21 EC-23.75	17'-3 $\frac{1}{16}$ "	17'-11 $\frac{3}{16}$ "	16'-8 $\frac{3}{8}$ "	8.775	34100	400.26	1365	34500
	22 PC-27 & 22 EC-23.75	18'-1 $\frac{1}{16}$ "	18'-9"	17'-6 $\frac{1}{16}$ "	9.508	37230	419.32	1430	37649

In the table, the first data given in each division is for the smallest circle that can be made without bending the webs of the piling.

The last data listed in each division of the table is by no means the largest circle that can be designed. There is no limit to size of circle that can be made, regardless of section used.

Information concerning circular construction in the larger diameters will be furnished upon request. Also, if engineering data is desired on circular construction smaller than is given in the tables, the economical analysis will be furnished upon request.

Other sections than shown in the tables can be used in circular construction. Additional details and tables will be furnished on request.

Note: Dimensions and properties of J&L Steel Piling Sections given in these pages are as of May 1, 1933. The JONES & LAUGHLIN STEEL CORPORATION should be consulted for additional detailed information and improvements in above sections and for data on new sections before steel piling projects are designed.

METHODS OF DRIVING J & L STEEL PILING WITH PILING WEBS IN LINE

Because of the character of design of the shank and the universal interlock, J & L Steel Piling Sections EC-22, EDC-24.6 and EC-23.75 can be driven with webs in line. A wall of this type can be made using either one of the three sections or combinations of any two. However, the J & L engineering staff should be consulted before driving of EC-22 in straight line is undertaken.



Detail Showing Section EC-22 Driven with Webs in Line
(Use only after consulting J & L engineering staff)

Distance made in wall by each pile: 17½ in. (minus). Minimum thickness of web and interlock: ⅜ in. Section modulus of section: 5.20 in.³ Section modulus per 12 in. of wall: 3.50 in.³

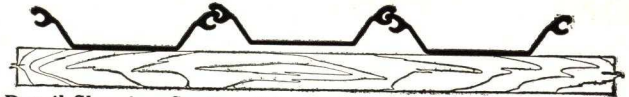


Detail Showing Section EC-23.75 Combined with Section EC-22 Driven with Webs in Line

Average distance made in wall by each unit: 17½ in. (minus). Minimum thickness of web and interlock: ⅜ in. Average section modulus of section: 5.86 in.³. Average section modulus per 12 in. of wall: 4.12 in.³

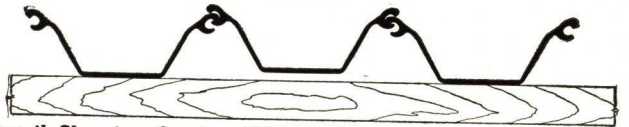
Driving these sections with webs in line does not affect the watertightening action of the interlocks when under stress or pressure.

For foundation work this type of piling wall produces a saving in excavation and concrete, especially when concrete footings are placed under water against piling.



Detail Showing Section EC-23.75 Driven with Webs in Line

Distance made in wall by each pile: 16½ in. (minus). Minimum thickness of web and interlock: ⅜ in. Section modulus of section: 6.53 in.³ Section modulus per 12 in. of wall: 4.75 in.³



Detail Showing Section EDC-24.6 Driven with Webs in Line

Distance made in wall by each pile: 16½ in. (minus). Minimum thickness of web: ⅜ in. Minimum thickness of interlock: ⅝ in. plus. Section modulus per 12 in. of wall: 10.20 in.³

This section can be combined with Sections EC-22 and EC-23.75 and driven with webs in line.

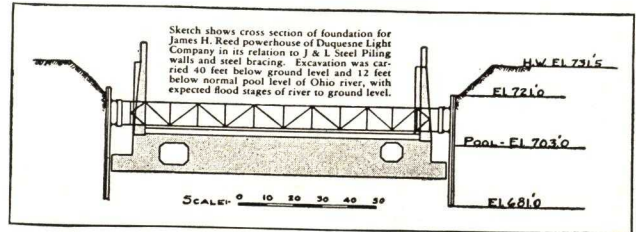
APPLICATION OF J & L STEEL PILING, WITH STANDARD I-BEAMS, TO OPEN COFFERDAMS

New economies in open cofferdam construction, made possible by use of J & L Steel Piling in combination with standard I-beams and steel bracing, were first demonstrated in construction of the James H. Reed Powerhouse of the Duquesne Light Company, Brunot Island, Pittsburgh.

J & L Steel Piling Section PC-27 was used, with alternate piles having a 12-in. I-beam riveted to webs, as inside piles of the steel walls, which were held at top by a well-designed trussed steel bracing. The intermediate piles acted as in standard cofferdam construction, interlocks closing as pressures were developed by the deep excavation, and making tight sidewalls for the cofferdam. The completed piling walls and steel bracing were designed to have suitable stiffness to permit excavation, by steam shovel and truck, in minimum time, and provide 16 ft. of clear space under the bracing in which to economically place concrete foundations for the powerhouse.

Upon completion of foundation and sidewalls to elevation of the steel bracing, a backfill was made, releasing the bracing,

and allowing continuation of the construction of sidewalls and structure without interference. Further economies were effected by permanent use of the steel bracing in other parts of the work, after removal from the cofferdam, and by pulling part of the J & L Steel Piling and redriving for permanent use in other sections of the project.



WEIGHTS AND SECTION MODULI OF COMBINED SECTIONS OF J & L STEEL PILING WITH I-BEAMS

Size and wt. of beam	Pile section		Weight of combined section per lineal foot of pile		Weight of combined section per square foot of pile		Section modulus of combined section		Section modulus of combined section	
	No.	Driving distance, in.	Including rivets, lb.		Including rivets, lb.		Per lineal foot of pile, in. ³		Per lineal foot of wall, in. ³	
			Without rivets, lb.		Without rivets, lb.		Per square foot of wall, in. ³		Per square foot of wall, in. ³	
8 in. I @ 20.5 lb.	EC-22	17½	54.5	53.0	37.1	36.1	23.4	15.9	17.9	12.2
	EC-23.75	16½	54.5	53.0	39.6	38.5	25.1	18.2	18.4	13.3
	PC-27	14½	54.5	53.0	45.1	43.9	27.4	22.6	19.2	15.9
	EDC-24.6	16½	55.8	54.3	40.3	39.5	33.6	24.5	22.8	16.6
	DC-25	16¼	55.8	54.3	41.2	40.1	34.3	25.3	23.4	17.3
10 in. I @ 25.4 lb.	EC-22	17½	59.4	57.9	40.4	39.4	34.2	23.3	27.8	18.9
	EC-23.75	16½	59.4	57.9	43.2	42.1	36.0	26.1	27.8	20.2
	PC-27	14½	59.4	57.9	49.2	48.0	38.2	31.6	28.3	23.4
	EDC-24.6	16½	60.7	59.2	43.8	43.0	44.8	32.7	29.7	21.8
	DC-25	16¼	60.7	59.2	44.8	43.7	45.5	33.6	30.5	22.5
12 in. I @ 31.8 lb.	EC-22	17½	65.8	64.3	44.8	43.8	48.5	33.0	40.8	27.8
	EC-23.75	16½	65.8	64.3	47.8	46.7	50.3	36.6	40.5	29.4
	PC-27	14½	65.8	64.3	54.4	53.2	52.6	43.5	40.5	33.5
	EDC-24.6	16½	67.1	65.6	48.4	47.7	59.7	43.6	41.1	29.9
	DC-25	16¼	67.1	65.6	49.5	48.4	60.6	44.7	41.5	30.6
15 in. I @ 42.9 lb.	EC-22	17½	76.9	75.4	52.3	51.3	76.4	52.0	66.8	45.5
	EC-23.75	16½	76.9	75.4	55.9	54.8	78.3	56.9	67.0	48.8
	PC-27	14½	76.9	75.4	63.6	62.4	80.9	60.9	65.6	54.5
	EDC-24.6	16½	78.2	76.7	56.4	55.8	88.6	64.7	64.4	47.0
	DC-25	16¼	78.2	76.7	57.7	56.6	89.4	66.0	64.5	47.6
18 in. I @ 54.7 lb.	EC-22	17½	88.7	87.2	60.4	59.4	111.2	75.7	100.0	68.1
	EC-23.75	16½	88.7	87.2	64.5	63.4	113.5	82.5	99.0	72.0
	PC-27	14½	88.7	87.2	73.3	72.1	116.0	96.0	95.2	78.7
	EDC-24.6	16½	90.0	88.5	64.9	64.3	125.0	91.3	95.8	69.6
	DC-25	16¼	90.0	88.5	66.4	65.3	127.8	94.3	95.8	70.7

Note: Dimensions and properties of J & L Steel Piling Sections given in these pages are as of May 1, 1933. The JONES & LAUGHLIN STEEL CORPORATION should be consulted for additional detailed information and improvements in above sections and for data on new sections before steel piling projects are designed.

MacARTHUR CONCRETE PILE CORPORATION

19 West 44th Street, NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, MASS., 101 Tremont Street

NEW ORLEANS, LA., 833 Howard Avenue

PITTSBURGH, PA., Union Trust Building

MacARTHUR CONCRETE PILE CO., LTD., New Birks Building, MONTREAL

"A Special Pile for Every Condition—Not One Pile for All Conditions"

The MacArthur Method employs "A Special Pile for Every Condition—Not One Pile for All Conditions" but the method of forming each type is such that all can be placed with our standard equipment. Therefore, when unexpected subsoil conditions are encountered and a change in plans becomes suddenly necessary, there is no delay incidental to bringing in equipment for special piles, as the equipment is already on the site and all material used is available locally.

MacArthur Concrete Piles are all cast-in-place piles and are all of the straight shaft type. They include:

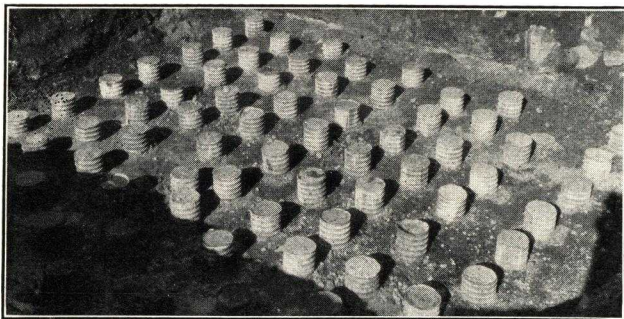
Straight Shaft and Pedestal Piles—These are our standard uncased compressed concrete piles. Used for all ordinary soil conditions where piles up to 40 ft. in length are required.

Composite Piles of Cased Concrete and Timber—For use where bottom (timber) section of pile is below permanent water level. More economical than all-concrete. Placed in lengths up to 100 ft.

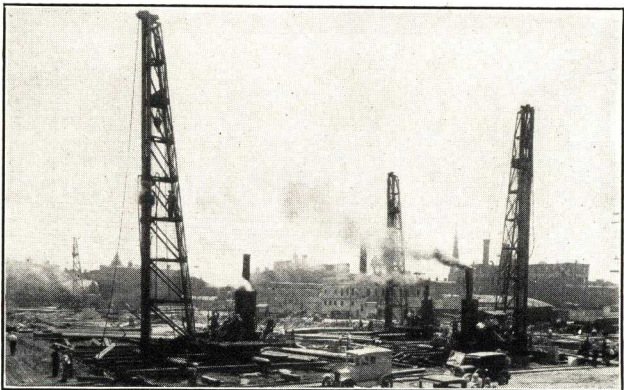
Composite Piles of Concrete and Pipe—Uncased upper section of compressed concrete and lower section of closed end pipe—any length. For use in very soft soils where piles have to be driven to great depths.

Pipe Piles with Cast Steel Point—Filled with concrete to any length. Economical for driving where headroom is limited, such as for underpinning foundations or making new foundations inside existing buildings.

Cased Concrete Piles—Straight shaft, uniform diameter top to bottom.



Group of MacArthur Cased Piles Driven for Cincinnati Union Terminal
We had 19 separate contracts for this development



Site of U. S. Post Office, Cincinnati, Ohio
SAMUEL HANNAFORD & SONS, Architects, U. S. Treasury Department
Contract calls for MacArthur Cased Piles, as shown above

Straight Shaft Uncased Compressed Concrete Piles for All Ordinary Soil Conditions

Maximum Skin Friction—The MacArthur uncased pile calls for a workable dry mix concrete compressed under a weight of 7 tons after the concrete is poured. This forces a dense, homogeneous concrete into intimate contact with the surrounding soil and gives the maximum skin friction with the earth.

The compressed concrete is so much denser than the surrounding soil that it cannot be disturbed, distorted or forced out of place by the driving of adjacent piles, as might be the case with a wet un-compacted concrete even though enclosed by a thin metallic casing.

Perfect piles are formed on 2 ft. 6-in. centers in the toughest and most rubbery of clays by this method. Large numbers of excavated piles have proven the certainty of this method.

Uniform Diameter

—The MacArthur Method for uncased compressed concrete piles employs a steel driving shell with walls $\frac{1}{2}$ in. thick and of uniform diameter throughout its entire length. There is no question, when this is driven to penetration, about the shell being intact and absolutely true in diameter throughout while the concrete is being placed. It also makes a pile as strong at the base as it is at the top—a pile with twice the diameter at the base as the ordinary tapered form of pile and with more concrete in each pile.

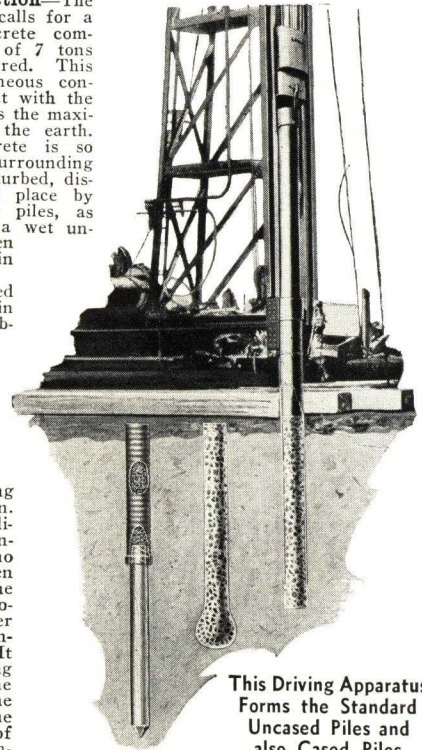
Concrete Easily Rammed or Compressed—It is a known fact, demonstrated by years of practice, that concrete should be rammed or compressed after being placed in the forms, so as to secure perfect cohesion and to remove voids caused during pouring.

The MacArthur Standard Method calls for a concrete compressed under a weight of 7 tons in each pile, after the concrete is placed.

"Dry Mix" Concrete Recommended for Cast-in-place Piles—In a cast-in-place pile it is necessary to dump the concrete down a steel shell a considerable distance. Therefore when a wet sloppy mix is used, the sand, cement, water and stone will undoubtedly separate and the chance of the aggregates again arranging themselves in correct proportion when they arrive at their destination is very remote indeed.

The MacArthur Method calls for a water ratio of 6 gal. of water per bag of cement with sufficient coarse aggregates to make what is termed a "dry mix."

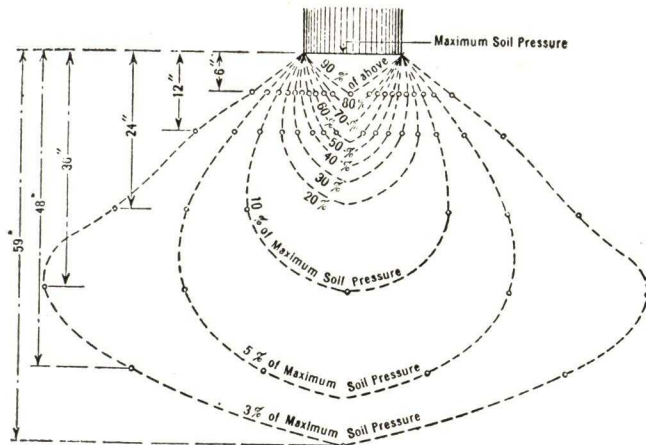
Note: See recommendations of Portland Cement Association in their booklet "Design and Control of Concrete Mixtures."



This Driving Apparatus Forms the Standard Uncased Piles and also Cased Piles



Goodyear Zeppelin Corporation Airship Factory and Dock, Akron, Ohio
WILBUR WATSON & ASSOCIATES, Architects and Engineers
Demonstrated merit won this contract for us



Load Distribution by Bulb Pressure

"John F. Greathead, C.E., Section Engineer in the days of the William Street, New York, Subway, plotted lines of equal vertical pressure beneath a 13½-in. circular plate, disclosing, in a manner which can be readily grasped, the general distribution of pressure beneath a footing. This he called the *Bulb of Pressure*." Lazarus White on the "Science of Foundations," (Trans. A.S.C.E., Vol. 93, 1929, p. 335). The above diagram is reproduced from this paper



Bulb End of Excavated MacArthur Pile

MacArthur Pedestal Pile driven in soft soil of absolutely uniform pressure. Its similarity to the 3% section of the diagram (at the left) shows that this bulb, formed under pressure from above, has assumed the form most capable of sustaining weight

Open Specifications for Cast-in-place Concrete Piles

(For Incorporation in Architect's and Engineer's General Specifications)

Concrete Pile Construction—Concrete piles shall be provided where shown and called for on plans. The price shall be calculated on the basis of lineal feet each. Contractors shall state plus and minus price per pile and per lineal foot for actual length driven.

Concrete piles shall be driven to a bearing value as determined by the Engineering-News Formula and if necessary, in the judgment of the architect or engineer, load tests shall be made on (one or more) piles, at the expense of the owner. The total settlement of pile shall not exceed one one-hundredth of an inch per ton of test load applied.

Concrete piles cast-in-place may be straight shaft or tapered. The working load on each pile shall be pounds. Piles shall be cast in strong removable steel shells, or light gauge steel reinforced, or corrugated, or plain shells to remain in place.

Note: In the removable shell type the concrete shall be constantly compressed while the shell is being withdrawn.

Concrete—Concrete shall be mixed in the proportion of 1 part of cement, 3 parts of sand and 5 parts of stone or gravel, all as approved. A water ratio of 6 gal. per bag of cement shall be used as closely as possible so as to obtain a dry enough mix to keep the component parts of the concrete from separating while being poured into the shell. A wet, sloppy mix of concrete shall not be allowed. The concrete shall be tamped as it is being deposited or compressed after it is deposited.

Borings—(State hereafter information on and instructions regarding soil samples and boring diagrams.)

Special Notes and Engineering Information on Cast-in-place Concrete Piles

Engineering-News Formula—

$$L = \frac{2WH}{S + 0.1} \quad \left\{ \begin{array}{l} L = \text{Load in pounds} \\ W = \text{Weight of falling parts in pounds} \\ H = \text{Drop in feet of falling parts} \\ S = \text{Final penetration per blow in inches} \end{array} \right.$$

A No. 1 steam hammer has a weight of 5000 lb. falling 36 inches.

Pile Length—It is necessary to adopt in the specification a length of pile so as to secure uniformity in the bids. This length can be determined approximately from examination of the borings. (We will be glad to make recommendations covering correct bid length upon receipt of boring data.)

Pedestal Piles—It is sometimes found that there is a firm stratum of soil lying between layers of poor soil which would sustain the superimposed load if it could be properly distributed by a larger base than is possible with standard diameter piles, thereby making a desirable saving in pile length. Also, in some cases the foot of the concrete pile rests on an inclined rock, which tends to cause a side slip of the pile. The addition of a pedestal overcomes this danger by giving a larger end bearing and more intimate bond.

Reinforced Piles—Piles may be reinforced with single central rod or with a hooped cage without delay in driving operations. When so reinforced these piles may be used to withstand uplift (43-ton test load has been withstood without movement). This is valuable to resist overturning movement due to wind; or to reduce cantilever action.

Metal Shoe—In wet or semifluid soils pile forming casing is sealed before driving with a suitable metal shoe.

References

Bartlett-Hayward Co., Baltimore; H. K. Ferguson Co., Cleveland; William Higginson, New York; D. X. Murphy & Bro., Louisville; B. H. Davis & Co., New York; Willys-Overland Co., Toledo; Mills, Rhines, Bellman & Nordhuff, Toledo. Additional references on request.



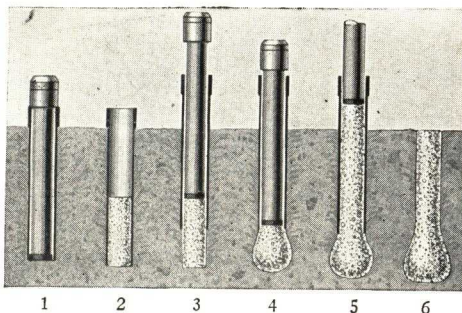
Three Bulb Ends of MacArthur Piles Excavated for Examination

Note how each bulb adapts itself to the condition of the soil immediately surrounding it.

(1) Dense soil, uniform pressure. (The pressure being uniform, the bulb took on form similar to the 10% section in the diagram). (2) Dense soil, uneven pressure. (3) Dense rocky soil

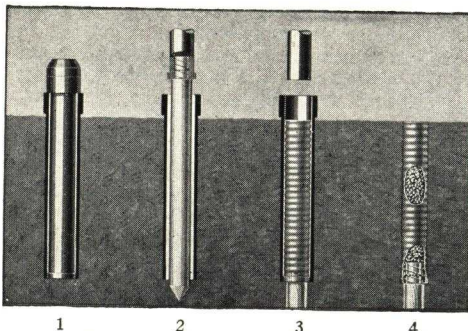
MacArthur Compressed Concrete Straight Shaft Pedestal Type

(1) Core and casing driven into ground. (2) Core removed, charge of concrete dropped to bottom of casing. (3) Casing pulled up 18 in. to 3 ft. with 7-ton pressure of core and steam hammer remaining on concrete. (4) Charge of concrete rammed out. (5) Core is removed, casing filled with concrete. Core replaced and casing steadily withdrawn while concrete is under 7-ton pressure. (6) Finished shaft with enlarged base



MacArthur Composite Type (Cased Concrete and Wood Pile)

(1) Core and casing driven into ground. (2) Core withdrawn and timber, with pan on shoulder, placed in casing. (3) Timber guided by casing, driven down to give necessary bearing. Butt of timber below ground water level. Core withdrawn and permanent shell inserted through casing and locked to timber and pan. (4) Casing withdrawn and concrete deposited in permanent corrugated shell



RAYMOND CONCRETE PILE COMPANY

INCORPORATED AUGUST 18, 1902

Concrete Piles and Special Concrete Work

140 Cedar Street, NEW YORK, N. Y.

111 West Monroe Street, CHICAGO, ILL.

BRANCH OFFICES IN PRINCIPAL CITIES, IN CANADA AND ABROAD

Services and Facilities

Our staff of experts is at your service to assist in the design and installation of concrete piles for all purposes and to meet all conditions.

Our engineering department is available to engineers and architects at all times for investigation work and consultation, and we will gladly submit recommendations, designs and estimates covering any problem within the scope of our business.

*A form for every pile—
A pile for every purpose.*

Classification of Concrete Piles

Concrete piles are of three types: "Cast-in-place"; "Pre-cast" and "Composite."

Cast-in-place Concrete Piles—Piles which are made in place are commonly referred to as "cast-in-place" concrete piles, and are divided into two classes:

- Those in which a form is left in the ground to preserve the integrity of the finished pile, and the driving resistance created (the Raymond Standard Method).
- Those in which the concrete is placed by means of a temporary driving form which is removed before the concrete hardens, leaving the pile confined only by earth (not the Raymond Standard Method).

Pre-cast Concrete Piles—Piles of this type are cast in forms or moulds, then driven like wooden piles.

Composite Piles—This type is made by superimposing a cast-in-place concrete pile, or section, on a previously driven wood pile. Generally used where unusual depths are encountered.

The Gow Company, Inc., an affiliated corporation, has for many years, specialized in caissons of all kinds, and is prepared to make borings or soil investigations in any part of the United States

RAYMOND CAST-IN-PLACE CONCRETE PILES

The Raymond Method (Standard)

A collapsible steel core, usually 8-in. diam. at the point and increasing in diameter at the rate of 0.4 in. per lin. ft. of length, is incased by a spirally reinforced steel metal shell.

The core, thus incased, is driven to a proper penetration in accordance with the *Engineering News* formula.

It is then collapsed and withdrawn from the shell, the shell remaining in the ground, maintaining the resistance generated in the driving.

The shell-lined hole is then inspected and if found perfect from tip to top is filled with concrete, making a perfect concrete pile.

Under certain conditions we use a core with a larger point diameter.

Advantages

(1) Absolute permanency: immunity from decay or from the attacks of wood borers and destroyers.

(2) Economy, because of greater carrying capacity—meaning a less number of piles for a given load. The greater carrying capacity rests upon several points—to wit:

- Greater size, therefore greater displacement and frictional area.
- Greater taper, therefore greater frictional value per square foot.

- Perfect shape, therefore positive contact with the ground at every point.
- Possibility of inspection after driving, hence the ability to load to full capacity, instead of making a large allowance for inefficiency as in the case of wood piles subject to injury by over-driving, telescoping, departing from the vertical, and like defects, none of which are discernible at the moment when correction is possible.
- Decreased length of pile as a natural consequence of greater size and taper.

(3) Smaller and lighter footings, because of decreased number of piles, hence less dead load to be carried.

(4) No charge is made for unused pile lengths above "cut-off."

(5) Practical elimination of shoring, underpinning, sheeting, pumping and deep excavation and the reduction of masonry.

(6) Due to decreased number of piles and consequent reduction in width of wall footings, the center line of columns can be brought nearer to the building line.

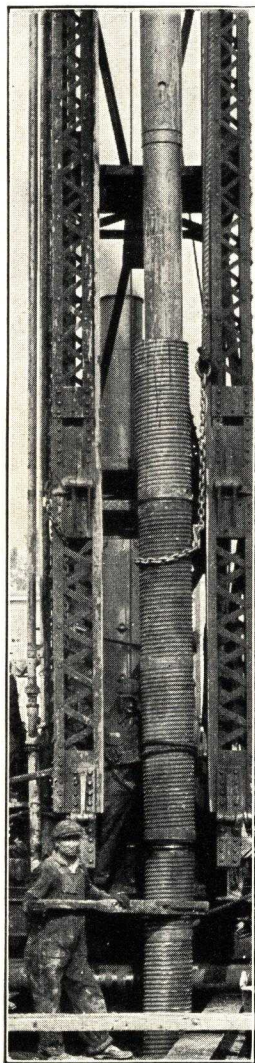
(7) Important saving in time caused by:

- The smaller number of piles required.
- The reduction in the amount of excavation, shoring, sheeting and pumping.
- The reduction in quantities of footing or masonry.
- Manufacture of the pile in place, from materials readily procurable in all localities, and limit of manufacture to the actual number and exact length of piles required. There is no delay for cutting and trimming trees, hauling to shipping point, transporting for great distances by rail or water and delivery to the job, perhaps only to find that the piles are too long or too short.

Loads and Spacing

Usually Raymond Concrete Piles are driven to carry a working load of 30 tons each, but in some cases, from 35 to 40 tons are safely carried.

A working load of 30 tons per pile is accepted by all building departments. The usual spacing of Raymond Concrete Piles is 2 ft. 6-in. centers for piles less than 30 ft. in length, and for piles in excess of 30 ft. in length, a spacing of 3-ft. centers is more desirable. In view of the very wide variation in soil conditions and other difficulties surrounding a job, it is suggested that the nearest Raymond office be conferred with, so that the site can be investigated and recommendations made.



Installing Raymond Step Tapered Concrete Piles 50 Ft. or More in Length

After long experimentation, we have perfected a method of installing long concrete piles which retains the essential principles of Standard Raymond construction.

Some 500,000 ft. of these piles have been installed on important Government, State and Corporate works. In all cases, they have received the enthusiastic approval of the engineers. We are now prepared to install these piles wherever special conditions require.

These piles ordinarily have a 10-in. point, the diameter increasing 1 in. for each 8 ft. of pile length, so that when over 40 ft. long the top diameter is at least 15 in.

The unusually strong construction of the steel mandrel and shells enables this pile to penetrate material heretofore impossible.

An inquiry will convince you that they are economical in cost



Steel Casing as a Permanent Form

The Raymond Pile is the only concrete pile employing the driven casing as a permanent form to remain in the ground. This feature is essential for perfect dependable results. The province of the form or shell is manifold:

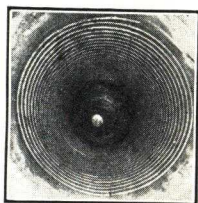
- (1) To serve as a form for the piles.
- (2) To prevent the admixture of foreign substances.
- (3) To retain the original moisture in the mixture until the concrete is thoroughly hardened.
- (4) To prevent distortion by external pressure, due to the driving of adjacent piles or accumulated pressures from displacement by the pile itself.
- (5) To perfectly retain the displaced earth forming the walls of the cavity, so that there may be no relaxation of the ground and therefore no loss of resistance when the displacing force (the core) is removed.
- (6) To act as reinforcement of the pile until the concrete shall have attained its maximum strength.



Section of
Steel
Casing

Advantages of Taper

The Standard Raymond Concrete Pile possesses an extreme taper and offers a maximum resistance for a given length—proved by a comprehensive record of resistance encountered in driving plus an extensive series of loading tests, during which the real carrying power of the pile has been checked with the driving resistance.



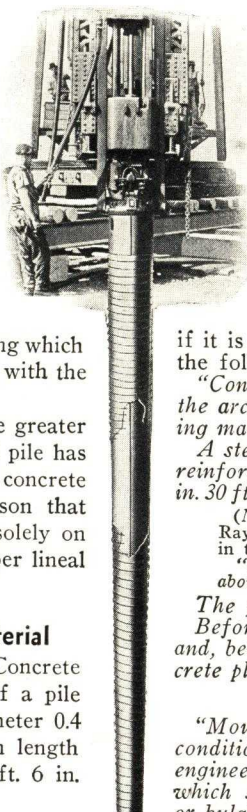
Looking Down Into a
Driven Shell—
30 Ft. Long

The failure to appreciate the greater carrying capacity of a tapered pile has increased the cost of many concrete pile foundations, for the reason that contracts are often awarded solely on the basis of the lowest price per lineal foot.

Sizes and Weight of Material

The Standard Raymond Concrete Pile is installed by the use of a pile core 8 in. diam. at the point and increasing in diameter 0.4 per lin. ft. of length. For instance a pile 20 ft. in length would be 16 in. diam. at the top, while a pile 37 ft. 6 in. long would have a top diameter of 23 in.

For dimensions of Raymond Step Tapered Concrete Piles see preceeding page.



Working Loads

In calculating the resistance to penetration, the *Engineering News* formula, based on using a steam hammer, has been generally adopted by the engineering profession.

This formula follows:

$$L = \frac{2WH}{S + 0.1} \begin{cases} L = \text{Load in pounds} \\ W = \text{Weight of falling parts in pounds} \\ H = \text{Drop in feet of falling parts} \\ S = \text{Final penetration per blow in inches.} \end{cases}$$

A No. 1 steam hammer has a weight of 5000 lb. falling 36 in.
A No. 2 steam hammer has a weight of 3000 lb. falling 30 in.

Thus the carrying capacity of the Raymond Concrete Pile is not a matter of guesswork or speculation, but is susceptible of computation and demonstration.

Prices

The Raymond Concrete Pile is "made-in-place" and not sold by the foot, f.o.b. cars, consequently it is impossible to quote prices without knowing the conditions under which the work is to be done.

For even approximate prices, it is necessary to have some knowledge of the number of piles, probable length, the approximate spacing, soil conditions, accessibility of the site, etc.

Specification

If "Raymond Concrete Piles" are called for, this is of course sufficient. On the other hand, if it is for any reason inadvisable to name them specifically the following specifications will cover:

"Concrete piles shall be of a type specially approved by the architect or engineer, and shall be placed in the following manner:

A steel mandrel or pile core shall be encased in a spirally reinforced steel shell (8 in. in diameter at the point and 20 in. 30 ft. above that point), and driven to a proper penetration.

(Note: Where special conditions indicate the desirability of Raymond Step Tapered Concrete Piles, change the parenthesis in the above paragraph to read:

"10 in. in diameter at the point and 15 in. in diameter 40 ft. above that point.")

The pile core shall then be withdrawn from the shell. Before placing the concrete, each shell shall be inspected and, being found perfect, shall thereupon be filled with concrete placed in accordance with the best practice."

or

"Moulded-in-place piles shall be of a type suitable for the conditions and subject to the approval of the architect or engineer. They shall be formed in casings left in place, which shall be of sufficient strength to prevent distortion or bulging after mandrel has been withdrawn and while the cavity is being filled with concrete or during the driving of adjacent casings."

OTHER TYPES OF RAYMOND PILES AND SPECIAL CONCRETE CONSTRUCTION

Raymond Composite Piles (Concrete and Wood)

For use where depths greater than 37 ft. 6 in. are encountered, we have developed a composite pile made up by superimposing a Raymond cast-in-place concrete section on a previously driven wooden pile, and placed composite piles exceeding 115 ft. in length.

Where long piles are required and permanent water level is within a reasonable distance below the surface, it is sometimes cheaper to substitute wood for concrete in that portion of the pile which is permanently submerged. The idea is not a new one but the development of a joint of sufficient strength and rigidity, together with a method that will insure uniform and satisfactory results, has required considerable thought and ingenuity and a long series of experiments.

After several years of experimentation and development, we have produced a joint between the wood and concrete sections which is practically as strong as any part of the completed pile. The Raymond Composite Pile is considered a recognized structural unit.

Wood piles, in order to be permanent, must be cut off below the water level. If they are permanently submerged, they will last for centuries, providing they are not attacked by animal life or chemical action. The Raymond Composite Pile consists of a wood pile, cut off below permanent low water, upon which is superimposed a Raymond Concrete Pile. Following this

method, more than 105,961 of Raymond Composite Piles have been driven aggregating more than 6,304,681 lineal feet and they meet the most exacting requirements.

The Company has, in actual practice, made numerous satisfactory load tests, some up to 60 tons on a single pile. Piles placed have varied in over-all lengths from 35 ft. to as much as 117 ft. with concrete sections varying from 8 to 22 ft. long.

Raymond Pre-cast Concrete Piles

Pre-cast piles are cast in moulds and then driven in place like wooden piles.

They have a large and useful field of application, particularly in marine structures, such as docks, bulkheads, etc.

The RAYMOND CONCRETE PILE COMPANY is prepared through its experience, to give good advice on the use of precast piles, and also to design and construct work in which a pre-cast pile can be used economically and advantageously.

Special Concrete Construction

In addition to the placing of standard Raymond Concrete Piles for foundation of structures on land, we construct and design permanent docks, piers, bulkheads, trestles, storage bins, retaining walls, bridges, heavy foundations, shipways, dry-docks, etc.

Each problem requires special study for solution and our experienced organization is yours to command.

NATIONAL GUNITE CONTRACTING COMPANY

OFFICES

82 West Dedham Street
BOSTON, MASS.

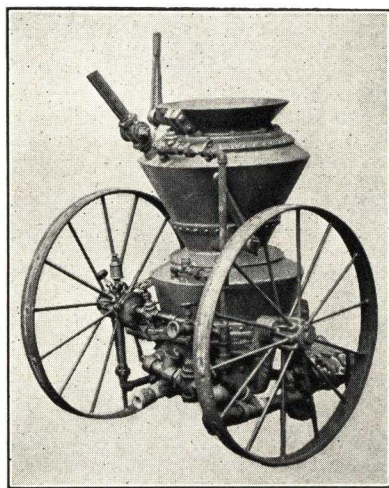
BUFFALO, N. Y., 505 Delaware Avenue
CHICAGO, ILL., 549 West Washington Street

NEW YORK, N. Y., Grand Central
Terminal Building

RICHMOND, VA., 1207 West Franklin Street
ST. LOUIS, MO., Louderman Building

GUNITE

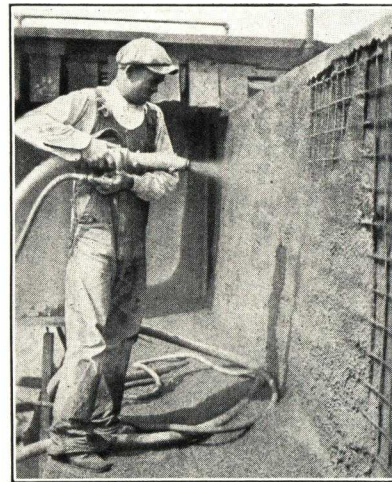
A Mixture of Cement, Sand and Water Shot Into Place Under Air Pressure



Cement Gun

To produce Gunite, a Cement Gun, shown at left, is required. Into this device premixed sand and cement, in dry state, are introduced at the top and then subjected to pressure obtained from an air compressor. This pressure drives the material out at the bottom of the Cement Gun into a hose through which it is carried to the nozzle in the hands of the operator, shown at right. The larger hose leading into the nozzle carries the dry material, the smaller hose carries water at a pressure somewhat higher than that obtaining in the material hose. This water is driven into the stream of dry material through a water ring fitted within the body of the nozzle thus saturating the cement and sand which continues on through the nozzle into place on the structure. The application shown in this picture is upon a vertical wall surface, but Gunite may also be readily applied downward to floor surfaces, or upward to ceiling surfaces, or to a surface sloping in any direction.

Our catalogue will gladly be sent upon request giving more complete data and description of Gunite and its uses. We solicit your consultation that we may place at your disposal the benefit of our many years' experience in this field.



Applying Gunite

CHARACTERISTICS OF GUNITE

- 1—It is *two to three times* as strong as ordinary field concrete.
- 2—Its moisture absorption is 3 to 5%, while good concrete absorbs 15 to 20%.
- 3—It is so compact when first shot that one can walk on it without damage.
- 4—It develops high strength quickly and will usually take full loading in 4 days.
- 5—Its quality is uniform throughout, whether in a 1-in. thick wall or a 12-in. wall.
- 6—Bonds perfectly to clean masonry surfaces of any kind.
- 7—Can be left with any desired finish similar to concrete by troweling, wood floating, etc.
- 8—Can be made of any size aggregate up to $\frac{3}{8}$ in. in greatest diameter.
- 9—It is not injured by freezing, because no excess water is used in its hydration.
- 10—It is proof against the action of salt water, and has high resistance to alkalis and acids.
- 11—It gives perfect protection to steel against corrosion.

IMPORTANT USES OF GUNITE

This list shown below of uses to which this remarkable material is adapted, is given simply to convey some idea to the engineer as to its suitability for work which he may be contemplating, either repairs or new construction.

Structural Steel Encasement
Walls and roofs for buildings
Waterproofing tanks of concrete or steel
Increasing strength of existing structures of concrete or steel
Combination wood and Gunite piles
Renewal of corroded steel structures
Baffle walls for Imhoff tanks
Facing building walls of brick, tile, etc.
Fireproofing of Wooden Structures such as
Bridges and buildings
Mine shafts and entry timbering
Piers and wharves
Reconstruction of Disintegrated Concrete Including
Breakwaters and dams
Bridges and buildings
Grain elevators
Piers and piles
Refrigerating rooms
Retaining walls
Stadiums and tanks

Linings for
Ash and soot hoppers
Beaters, vats and other paper mill structures
Breechings
Coal bunkers
Condenser tanks, reaction chambers, fractionating towers, etc., in oil refineries
Drainage ditches and irrigation canals
Gas purifiers
Mines
Penstocks and pipes
Reservoirs
Sewers
Shafts
Stacks
Tanks of concrete or metal
Tunnels
Rebuilding of Old Steel Structures such as
Ash handling plants
Coal handling plants
Quenching hoods
Steel stacks
Water coolers

AMERICAN LUMBER & TREATING CORPORATION

Wolman Salts A Universal Wood Preservative

ST. LOUIS OFFICE
Arcade Building

GENERAL OFFICES
332 South Michigan Avenue
CHICAGO, ILL.

NEW YORK OFFICE
25 Broadway

Products

GENUINE WOLMAN SALTS, a clean, odorless and paintable Wood Preservative and Fire Retardant. Have as high toxicity as that of any wood preservative in commercial use, have no corrosive effect on metal fastenings, and do not exude after treatment.

WOLMANIZED LUMBER and TIMBER (any species of lumber, poles, posts, or forest products treated under vacuum and pressure with Wolman Salts and by the Wolman Process).

What is Wolmanizing?

Wolmanizing is a process of preserving any kind of wood so as to give it a high degree of protection against decay and insect attack—making it fire retardant.

Contractors may secure Wolmanized lumber and other forest products, or have their own purchases treated at any of a large number of commercial pressure treating plants strategically located all over the United States, so as to serve any locality.

At each of these conveniently located points the material is treated by the full cell process in a closed retort under vacuum and pressure which insures a deep and dependable penetration of the preservative into all treatable areas of the wood.

A double-check analysis and technical inspection is maintained in both the manufacture of the Wolman Salts and in the Wolmanizing treatment.

General Commercial Usages

Some of the uses include roofing, flooring, sub-flooring, platforms, bridge timbers, planking, ties, fencing, dock superstructures, board walks, telegraph and transmission line poles, car lumber, lining of ice houses, or wherever conditions invite decay or termite attack.

Wood treated with Wolman Salts may be painted or stained after treatment. The cost of treatment is no higher than other preservative treatments, and often less.

Wolman Salts have a splendid 26-year record of service on a large scale in Central Europe.

Many million feet of Wolmanized lumber have been installed in the United States and Central America upon specifications of prominent architects and engineers.



Left

Facsimile of Brand
Certifying to
Correct Treatment
and
Dependable Protection
Which Will Identify
Wolmanized Products

List of users furnished on
request

Service Records

A recently completed survey and inspection of the principal installations in the United States and in Central America, made by the *Pittsburgh Testing Laboratory*, provides the following conclusion from the detailed technical report on Wolmanized Wood:

"Wolman Salts, when properly used as a wood preservative treatment, will protect wood so treated by preventing or inhibiting decay.

This conclusion is based on the following:

(a) The reliably reported successful use of Wolman Salts in Europe.

(b) The fact that no traces of decay were found in the installations examined by us in the United States. These included installations up to eight years of age.

(c) The fact that decay of Wolmanized wood examined by us in the tropics has been almost negligible, installations up to nine years of age being examined.

(d) The finding of Wolman Salts in the heart as well as outer sections of specimens of Wolmanized wood that had been in service for various lengths of time up to nine years.

Attack by Termites

Wolman Salts (Tanalith) when properly used as a wood preservative treatment will protect wood so treated by preventing or prohibiting the attack by termites. This conclusion is based on the following:

(a) The fact that no evidence of termite attack upon Wolmanized wood was found in the installations examined by us in the United States.

(b) The fact that we failed to find or learn of a single case of termite attack upon Wolmanized wood in the survey in Central America, of the Standard Fruit & Steamship Company's properties. This Company has used 35,000,000 feet of Wolmanized Lumber there during the last nine years.

(c) The finding of Wolman Salts by chemical analysis in all parts of specimens of Wolmanized wood taken after exposure to severe conditions in the tropics for various lengths of time up to nine years.

Respectfully submitted,

PITTSBURGH TESTING LABORATORY,
B. H. Witherspoon, President."

Specifications

All the lumber or timber specified to be Wolmanized, shall be given a pressure treatment of High Fixation Wolman Salts, the treating procedure to be in accordance with the published standard methods of the AMERICAN LUMBER & TREATING CORPORATION, and subject to the inspection of the Pittsburgh Testing Laboratory; the lumber to be branded with the Pittsburgh Testing Laboratory certification as to treatment.

The amount of Wolman Salts solution injected into the lumber or timber and its strength of concentration shall be so controlled as to leave not less than (*) pounds of dry salt for each cubic foot of material treated, and this shall permeate all of the sapwood and as much of the heart wood as practicable. No charge shall contain less than 90% nor more than 110% of the quantity of preservative specified.

*Insert the desired final retention of dry salt content which may vary from $\frac{1}{4}$ pound (mine timbers) to $\frac{1}{2}$ pound (building construction) or for ties, poles and outside construction $\frac{3}{8}$ pound of Wolman Salts for each cubic foot of the wood treated.

Note: After treatment lumber is to be properly piled and allowed to dry before using, to insure against excessive shrinkage after being put into service.

When the lumber is to be painted it is imperative that the wood be dry before applying paint.

Wolmanized Lumber in Yards

Many retail yards carry Wolmanized lumber in stock. If not available from your local dealer, write us for further information on prices on the treated lumber or on treatment only.

Information booklet gives you detailed information, fully illustrated. Write for copy today.

PROCESSED LUMBER COMPANY

FORMERLY AMERICAN WOLMANIZED LUMBER COMPANY

Wood Preservers
ELIZABETH, N. J.

Product

"AWLCO-IZED" LUMBER and SASH—for use wherever wood is subjected to moisture, humidity or other rot-producing conditions.

What "Awlco-ized" Stands For

"AWLCO-IZED" stands for undivided responsibility in lumber that has been treated against decay and other rot-producing conditions.

It represents a "product"—not simply a preservative or a process.

Complete Facilities

In addition to a modern vacuum-pressure treating plant, our facilities include a sawmill, planing mill and preframing plant, a sash and frame factory and dry kilns.

Preservative

The preservative we use is the sodium fluoride-dinitrophenol-chromate combination, commonly known as Wolman Salts. Its value has been demonstrated by many years of actual service.

Treatment

This consists of impregnation to refusal by the full cell vacuum-pressure process in accordance with standard specifications of the American Wood Preservers' Association.

Properties

"AWLCO-IZED" lumber is clean, odorless, non-corrosive to metal, practically colorless, burns less readily than untreated lumber and can be painted, stained or otherwise finished. All the desirable characteristics of the natural wood are retained—strength, elasticity, resiliency, low conductivity of heat and sound, together with the ease with which it is worked.

Life

The durability of lumber treated by our process is well established. "AWLCO-IZED" lumber can be depended upon to give at least three times the service life of untreated lumber installed under the same conditions.

The replacement of decayed wood usually involves the renewal of other materials in contact with it. With this in mind, the value of "AWLCO-IZED" lumber is easily appreciated. The comparatively small increase in the first cost of the building or structure is offset many times by the savings in replacement expense.

"AWLCO-IZED"
LUMBER RESISTS DECAY



Specialties in Stock

The following are always available for immediate shipment in carload or less than carload lots from our stock of lumber thoroughly air-seasoned after treatment:

Roof Plank, "Awlco-ized" Yellow Pine—Standard 2x6-in. and 3x8-in., tongued and grooved plank which will effectively

withstand the severe decay-producing conditions existing in dyehouses, bleacheries, weave sheds, paper machine rooms and similar highly humid occupancies.

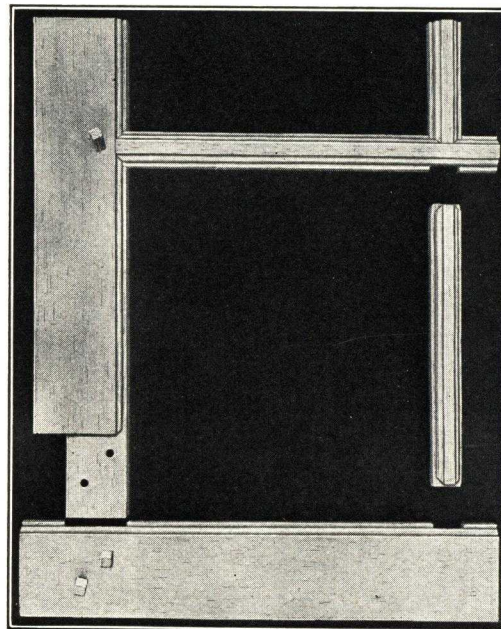
Being thoroughly air-dried, they are preshrunk and will therefore lay a roof that will stay tight and can be painted either before or immediately after installation.

Their low conductivity of heat is of material help in the prevention of condensation drip.

Bevelled Sleepers, "Awlco-ized" Yellow Pine—2x3 in., 2x4 in. and 3x4 in.

Subflooring, "Awlco-ized" Yellow Pine.

Trunking and Capping, "Awlco-ized" Yellow Pine.



Details of "Awlco-ized" Sash Construction
Note absence of steel pins

Sash and Screen Frames, "Awlco-ized"—Made of carefully selected clear white pine, treated in the rough and air-seasoned four to six months. Each piece tested for complete penetration of the preservative, thereby eliminating the possibility of exposing untreated areas during manufacture.

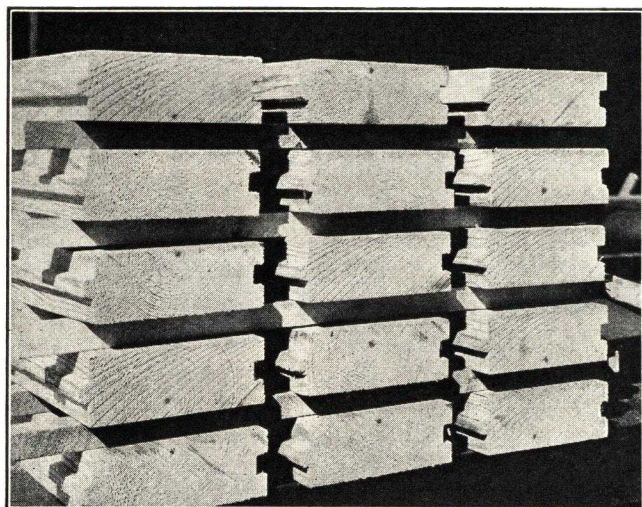
Construction details are such as give maximum mechanical strength. Joints are made with wooden dowels and waterproof glue. Furnished glazed or unglazed; plain, primed or painted, as desired. Each sash branded and dated.

Mill Construction, Bridges, Piers, Boardwalks, etc.

We also furnish large quantities of "Awlco-ized" structural timbers and decking for this class of work. This is all treated to order but, by drawing on our extensive untreated stock, we can make practically immediate shipment.

Protecting Lumber Against Termites

For lumber to be used in locations where attack by termites or white ants is a problem, we add an arsenical salt to our mixture, thereby giving the desired protection.



Treated Roof Plank Stacked for Final Seasoning
Note the careful spacing to afford maximum air circulation

THE WOOD PRESERVING CORPORATION

Preserved Lumber for Every Purpose

Koppers Building, PITTSBURGH, PA.

AFFILIATED COMPANIES

AYER & LORD TIE COMPANY
CHICAGO, ILL.

CENTURY WOOD PRESERVING CO.
PITTSBURGH, PA.

NATIONAL LUMBER & CREOSOTING CO.
TEXARKANA, ARK.-TEX.

SALES OFFICES

BALTIMORE, MD.
BOSTON, MASS.
CHARLESTON, S. C.
CHICAGO, ILL.

DENVER, COLO.
HOUSTON, TEX.
KANSAS CITY, MO.

LOUISVILLE, KY.
MEMPHIS, TENN.
MONTGOMERY, ALA.
NEW YORK, N. Y.

NEWPORT, DEL.
PHILADELPHIA, PA.
PITTSBURGH, PA.

REED CITY, MICH.
ST. LOUIS, MO.
SUPERIOR, WIS.
TEXARKANA, ARK.-TEX.

The Organization

The above operating affiliate companies of THE WOOD PRESERVING CORPORATION, with sales offices and pressure treating plants throughout the territory east of the Rocky Mountains, are prepared to supply all requirements of *Treated Lumber* for every purpose. Complete stocks of seasoned material are maintained at all times, ready for immediate treatment, and conforming to standard specifications, which give assurance of quick and efficient service.

Preservatives and Treatments

Various preservatives and treatments are available to meet the conditions of any particular installation; the more commonly used being creosote oil, zinc chloride, zinc meta arsenite, Wolman salts and montan-creosote. Material treated with salt solutions can be painted or stained the same as untreated wood.

Preventing Wood Waste

Certain species of wood are naturally more resistant to decay and insects than others. Unfortunately, the drain on such resistant woods has been heavy and in many instances the supply has been reduced to such an extent that values have increased to proportions precluding their use for certain purposes. With the use of an accepted standard preservative treatment many of the less durable species can be made more decay and insect-resisting than the naturally decay-resisting species in their natural state.

However, the mere subjection of wood to the process of treatment with a preservative material will not produce the desired results unless the preservative itself is an effective one, and proper methods of injecting it into the wood are followed. In order that the architect may understand the action of the preservative in preventing decay and insect attacks, let us examine briefly the causes of such damage.

Decay—Investigations show that decay in wood is always caused by fungi, which consist, for the most part, of very fine threadlike filaments that penetrate the wood in all directions.

The four requirements for the growth of fungi are moisture, air, favorable temperature and food. To prevent decay it is necessary to deprive the fungi of one or more of these requirements but this is usually impossible under ordinary conditions, except for food. Therefore, the most effective method of preventing decay is to make toxic the food supply and it is upon this principle that the successful use of wood preservatives is based.

Insects—Lumber in service is chiefly damaged by the termite, or as it is commonly called, the white ant. These are of two species, one the subterranean which attacks wood indirectly from burrows in the earth; and the other non-subterranean which attacks the wood of buildings or trees directly. The cellulose in the wood provides their food and they attack not only buildings but other forms of lumber as well.

Surface spraying with chemicals does not protect wood against such attacks as the termites attack from the inside. It has been definitely established, however, that wood treated

under pressure with the proper preservatives according to accepted standards, by which the preservative is forced into the interior of the wood, is effective against termite attack and should be used in any construction where termite damage may be feared.

By preventing decay and damage by insects, proper preservative treatment performs a triple service. It increases the life of the wood three or four times that of the natural life, thereby saving the consumer the cost of replacement several times during the life of the treated timber and eliminates the costly repair expense; it makes sapwood longer-lived than the more durable heartwood, thus making it unnecessary to specify heartwood for durability; and it permits the use of the naturally non-durable woods which otherwise have a much more limited usefulness.

Preserved Wood in Building Construction

In building construction, the use of preserved lumber has been comparatively limited because of unavailability and probably due to a lack of understanding as to its advantages and its possible application to particular needs. At first, the railroads were the large users of *preserved wood*, which began many years ago, and today its use has spread not only to all of the public utilities, but to practically all of the large industries in this country using wood for construction purposes. The features and merits of preserved materials which have made it so useful for large industries, make it even more desirable for building construction work.

A complete list of the places in which preserved lumber is especially useful is unnecessary here, but, in brief, these may be described as any portions of a structure in contact with or near the ground, in damp or poorly ventilated basements, or stringers, subflooring, window frames, roof timbers, and shingles. In such places decay is certain if moisture accumulates in the wood, and in some localities attacks by termites soon destroy such timbers and make replacement necessary.

Selecting the Proper Treatment

The selection of the proper preservative and treatment depends upon the purposes and location to timber use. As wood preservation is a highly specialized subject and one requiring the services of engineers who have made a careful study of the many problems involved, THE WOOD PRESERVING CORPORATION and its affiliated Companies offer the co-operation of their Research and Engineering Departments to assist the engineer, architect or contractor in selecting the treatment best suited to the project. Inquiry at the Home Office or any of the branches listed above will bring one of our engineers to your office, without obligation or cost, for consultation and assistance.

We will appreciate the opportunity of working with you to secure long lived lumber and maximum economy in wood construction, which is now available and obtainable from any of our advantageously located plants throughout the territory east of the Rockies.

OUR PRODUCTS

Treated by Recognized Processes and Preservatives

Foundation Timbers
Joists—Sills—Posts
Sub-flooring
Structural Lumber
Roof Stringers

Highway Guard Rails
Posts—Culverts
Bridge Material

Fence Posts—Poles
Piling—Cross Arms

Railroad Cross Ties
Crossing Plank
Car Stock

Mine Ties and Timbers
Retaining Walls
Cribbing

ACKERMAN-JOHNSON CO.

Expansive Screw Anchors, Expansion Bolts, Concrete Inserts

625 West Jackson Boulevard, CHICAGO, ILL.

NEW YORK OFFICE, 53 Park Place

Products

ACKERMAN-JOHNSON EXPANSIVE SCREW ANCHOR; EXPANSION BOLTS; CONCRETE INSERTS. U. S. Patents: April 27, 1915, December 21, 1915, April 4, 1916, May 14, 1918; others pending. Patented in Canada, Great Britain, France, Belgium; others pending.

Ackerman-Johnson Expansive Screw Anchor

Adaptability—For attaching objects to hard materials, as concrete, brick, stone, tile, marble, etc.

Description and Operation—Consists of a doubly tapered internally threaded cone made of brass, iron or steel (Fig. 1), within a lead composition ductile sleeve (Fig. 2). These are assembled at the factory, the sleeve being forced on the cone to a normal position as at Fig. 3.



Fig. 1



Fig. 2



Fig. 3

Ackerman-Johnson Expansive Screw Anchor

When installed as illustrated, the sleeve is driven farther toward base of the cone and is expanded generally to any degree required to swedge tightly against the sides of hole, effecting perfect holding contact throughout the length and circumference of the anchor. Thus consolidated with the wall material, the anchor provides a machine threaded hole the same as an ordinary tapped hole in a machine part. Any object may then be attached with a standard screw or bolt of suitable diameter.

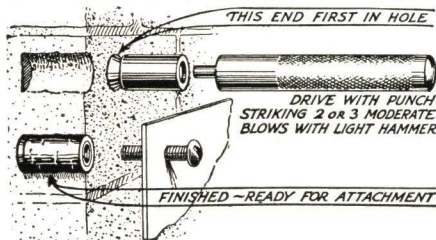


Fig. 4. Manner of Installing Anchor

The piloted setting punch supplied without charge with all anchors

The heavier the load attached, the more forcible becomes the expansion, causing the anchor to resist effort to pull it out far beyond the tensile strength of any screw or bolt.

Distinctive Advantages—Time saving through the use of Ackerman-Johnson anchors compared with old methods more than compensates their total cost.

They save much of drilling cost, requiring least depth for any stated load. They are installed instantly, without the aid of the screw, and before the fixture is lifted into position to be fastened. Their margin of safety is equal to that of steel bolts of correlating size.

They necessitate the least displacement of wall material and consequently less injury to buildings. They effect the neatest possible workmanship.

Sizes—The size of anchor is designated as the size of the bolt or screw to be used. Example: For

No. 10-24 screw, use No. 10-24 anchor; for $\frac{3}{8}$ -in. bolts use $\frac{3}{8}$ -in. anchor.

SIZES, EXPANSIVE SCREW ANCHORS

Screw or bolt sizes	Threads per in.	Minimum dimension of holes required, inches		Specify anchor Size No.
		Diam.	Depth	
No. 6	32	$\frac{1}{4}$	$\frac{3}{8}$	6-32
" 8	32	$\frac{5}{16}$	$\frac{1}{2}$	8-32
" 10	24	$\frac{3}{8}$	$\frac{1}{2}$	10-24
" 12	24	$\frac{7}{16}$	$\frac{3}{4}$	12-24
$\frac{1}{4}$ "	20	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{4}$ -20
$\frac{5}{16}$ "	18	$\frac{5}{8}$	1	$\frac{5}{16}$ -18
$\frac{3}{8}$ "	16	$\frac{3}{4}$	$1\frac{1}{4}$	$\frac{3}{8}$ -16
$\frac{7}{16}$ "	14	$\frac{7}{8}$	$1\frac{1}{2}$	$\frac{7}{16}$ -14
$\frac{1}{2}$ "	13	$1\frac{1}{8}$	$1\frac{1}{2}$	$\frac{1}{2}$ -13
$\frac{5}{8}$ "	11	$1\frac{1}{8}$	2	$\frac{5}{8}$ -11

Packed 50 or 100 in box.

Stud Type Expansion Bolts

So great is the holding power of this anchorage, that when set in strong stone or concrete with only its one primary sleeve expanded, the bolt shank can be pulled in two, without the anchorage yielding.



Bolt with Primary Expansive Sleeve Only



Bolt with Primary and One Secondary Expansive Unit

Secondary Expansive Units—Made up of an expansive sleeve and a slip

steel cone, giving additional anchorage equal to the primary unit. Calculate the minimum depth of holes for setting at twice the diameter of hole drilled.



Sectional View Showing Bolt with Primary Expansion Sleeve, One Iron Spacing Sleeve, and One Secondary Expansive Unit

Fig. 5. Stud Type Expansion Bolt

Diam. of bolt, at thread in.	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$
Diam. for hole in.	$\frac{3}{8}$	$\frac{9}{16}$	$\frac{3}{4}$	1	$1\frac{1}{8}$
Lengths of bolts in inches	$1\frac{1}{4}$	$1\frac{3}{4}$	$2\frac{1}{2}$	$3\frac{1}{2}$	5
	$1\frac{1}{2}$	2	3	4	6
	$1\frac{3}{4}$	$2\frac{1}{2}$	$3\frac{1}{2}$	5	$7\frac{1}{2}$
	2	3	4	6	9
	$2\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{2}$	$7\frac{1}{2}$	10
Other Lengths	3	4	5	9	12
	$3\frac{1}{2}$	$4\frac{1}{2}$	6	$10\frac{1}{2}$	15
	4	...	7	12	18
	...	...	8	15	...



Exterior View of New Ackerman-Johnson Concrete Insert



Cross Section Showing Insert Imbedded in Concrete

Concrete Inserts

Ackerman-Johnson concrete inserts for moulding into the concrete when poured, afford minimum displacement of the concrete and maximum speed in setting. Can be furnished for all sizes of screws and bolts up to $\frac{5}{8}$ -in. diameter.

We invite requests for full information concerning inserts.

Users of Ackerman-Johnson Products

Extensively adopted by leading contractors, manufacturers, railroads, shipyards, government departments and public utility companies.

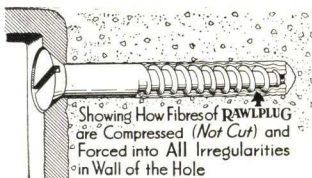
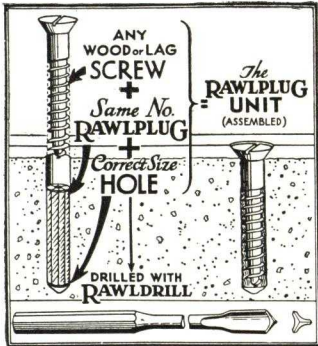
THE RAWLPLUG COMPANY, INC.

98 Lafayette Street, NEW YORK, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

Rawlplugs

Rawlplugs are screw anchors made of stiffened strands of tough jute fibre, cemented together by a patented process. Their grip is greater than any other screw anchorage device or expansion bolt because hole, Rawlplug and screw are of practically the same diameter. They can't help but hold fast in any material, be it wood, glass, masonry, plaster, slate, marble, tile, brick, or metal. Rawlplugs are not affected by moisture, and will not deteriorate, pulp, shear, or work loose.



RAWLPLUGS

As the hole required for a Rawlplug is no larger in diameter than the screw—it makes a neater appearing job—can be used in closer quarters—smaller hole saves on drilling time, and by using smaller drills saves on cost of drills—no spotting or layout work required as holes can be drilled right through screw holes in part to be fastened. They eliminate tapping of holes in metal. Rawlplugs eliminate the caulking operation required by metal shields.

SIZES, RAWLPLUG, RAWLDRILL, AND TOOLHOLDER

Rawlplug No. (Size)	Use with screw No.	Diameter drill required	Rawlplug No. (Not diam.)	Use with Toolholder No.	Size twist drill
6	5-6	$\frac{1}{8}$ "	6	8	No. 15
8	7-8	$\frac{1}{8}$ "	8		
10	9-10	$\frac{3}{16}$ "	10		No. 10
12	11-12	$\frac{7}{16}$ "	12	14	$\frac{1}{4}$ "
14	14) Or $\frac{1}{4}$ "	$\frac{3}{8}$ "	14		$\frac{3}{8}$ "
16	16) lag screw	$\frac{1}{2}$ "	16	20	$\frac{1}{2}$ "
20	20) Or $\frac{5}{16}$ " lag screw	$\frac{5}{8}$ "	20		$\frac{5}{8}$ "

*Adaptable to fit No. 14 Toolholder.

Lag Screw Sizes

$\frac{3}{8}$ "	$\frac{3}{8}$ "	$\frac{1}{8}$ "	For $\frac{1}{4}$ " lag screw use No. 14 or No. 16 Rawlplug
$\frac{7}{16}$ "	$\frac{7}{16}$ "	$\frac{1}{2}$ "	
$\frac{1}{2}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	For $\frac{5}{16}$ " lag screw use No. 20 Rawlplug
$\frac{5}{8}$ "	$\frac{5}{8}$ "	$\frac{3}{4}$ "	

Rawldrills

The most economical masonry drills on the market at any price, considered from the standpoint of life and drilling speed.

Three-point design, centers at first blow and can be resharpened on any grinding wheel.

Parallel sides maintain cutting diameter. Enlarged handle (or holder) eliminates shock to hand, presents larger striking surfaces, makes drill easier to turn.

High grade tool steel, accurately forged or machined and heat treated.

Rawlplug Size Data

For Hand Drilling



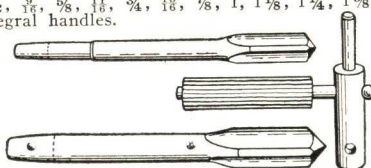
Machine Type—Sizes Nos. (for diameters see above table) 6, 8, 10, 12, 14, 16, 20 and $\frac{1}{16}$ in., with tool holders to fit.



Standard Type— $\frac{3}{8}$ ", $\frac{7}{16}$ ", $\frac{1}{2}$ ", $\frac{5}{8}$ ", $\frac{11}{16}$ ", $\frac{3}{4}$ ", $\frac{13}{16}$ ", $\frac{7}{8}$ ", 1 ", $1\frac{1}{8}$ ", $1\frac{1}{4}$ ", $1\frac{1}{2}$ ", $1\frac{3}{4}$ " ins. with forged integral handles.

For Power Drilling

Taper Shank—Same sizes as standard type, for use with electric or compressed air chipping hammers. Rawlchucks are available for all types of hammers.



RAWLDRILLS

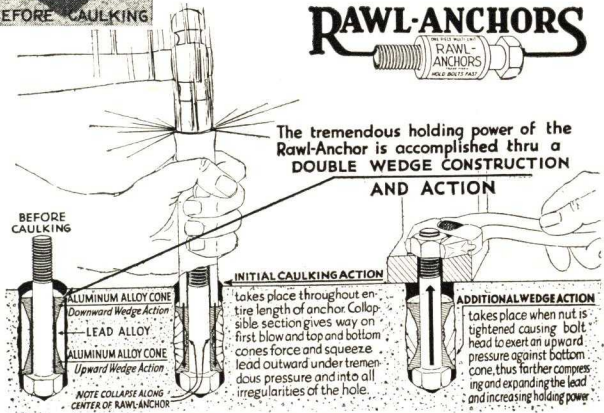


Rawl-Anchors

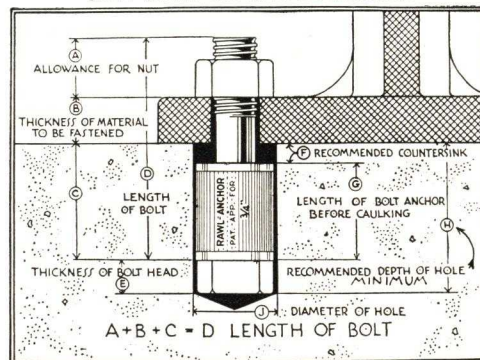
A one-piece, heavy duty, double-expanding, double-ended masonry anchor for bolts. It is foolproof—impossible to misapply. This aluminum alloy and lead anchor, with its scientifically designed and patented double cone construction, has a holding power in excess of any two-unit anchor. It is easier to handle, and requires but one caulking operation.

Double aluminum alloy cones when caulked (see illustration) force lead out and provide an anchor of unequalled holding power—there is no limit to expansion of the lead. Bolt head becomes embedded in aluminum alloy collar and cannot turn.

RAWL-ANCHORS



SIZE DATA ON RAWL-ANCHORS

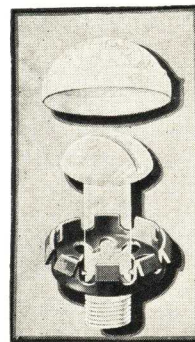


BOLT DIMENSIONS BASED ON "MFGRS." OR "AMERICAN" STANDARD MACHINE BOLTS

Diam. bolt.....Inches	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	1
Bolt head.....Inches	Sq.	Sq.	Sq.	Hex.	Hex.	Hex.
A.....Inches	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	1	$1\frac{1}{2}$
B.....Inches	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	2	$2\frac{1}{4}$
C.....Inches	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$
D.....Inches	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
E.....Inches	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
F.....Inches	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
G.....Inches	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
H.....Inches	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
I.....Inches	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
J.....Inches	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

*Or $\frac{3}{4}$ ". †Or $1\frac{1}{8}$ ". ‡Or $1\frac{3}{4}$ ".

The Crowner—The Lok-Crowner



Crowners and Lok-Crowners provide a simple, effective and artistic means of sealing and concealing screw and bolt heads, nuts, etc. They permit the use of stronger and less expensive iron screws and bolts instead of brass, bronze or plated material and obviate the necessity of countersinking. Easy to use and apply. Crowner is in one piece. Lok-Crowner consists of lockwasher and cap. Bakelite Lok-Crowners may also be had for electrical insulation.

Sizes to fit all standard screws and bolts.



We will be glad to send to any interested parties, complete information and prices on any of the items on this page.

INDUSTRIAL BUILDING PRODUCTS

Concrete Reinforcement

Doors

Fencing

Floor and Roof Systems

Flooring

General Wire Work

Glass and Glass Enclosures

Hollow Tile

Paints

Partitions

Paving

Roof Ventilators

Roofing

Shades

Skylights

Stairs, Treads and Gratings

Structural and Miscellaneous

Iron and Steel

Waterproofing, Dampproofing
and Floor Treatment

Windows

ACQUA-PRUF, INC.

Manufacturing Chemists, Waterproofing Engineers and Consultants
786 Broad Street, NEWARK, N. J.

FACTORY: DEAL, N. J.

LABORATORY: BRADLEY BEACH, N. J.

REPRESENTATIVES IN PRINCIPAL CITIES

ACQUA-PRUF, A LIQUID INTEGRAL FOR CONCRETE

Waterproofs, Densifies, Quick-sets, Strengthens, Resists Acids, Prevents Freezing

Description of Acqua-Pruf

Acqua-Pruf is a liquid integral—a compound of chemicals which has an affinity for portland cement. When added in proper proportions to the gauging water, Acqua-Pruf produces a fast setting concrete or mortar which is dense, waterproof, hard and dust-proof. It is emulsifiable but not soluble in water. It is neutral—neither a biting acid nor a corrosive alkali. It lubricates the aggregates, causing a closer binding and denser concrete. By its chemical reactions, Acqua-Pruf reduces the number of pores to a minimum and its water-repellent properties prevent later absorption.

Under normal conditions, the standard proportion recommended is 1 qt. of Acqua-Pruf per bag of cement, or 1 part Acqua-Pruf to 17 parts water—increasing the percentage of Acqua-Pruf accelerates the set with no destructive effects. By the use of Acqua-Pruf, the amount of gauging water should be reduced from 6 gal. per bag of cement in 1:2:4 mix to 5 gal. or less per bag and will increase the workability of the mix.

Acqua-Pruf is guaranteed to retain its potency until used. It is supplied in 5 and 30 gal. drums.

Acqua-Pruf costs less—because you use less.

A Brief Summary of Acqua-Pruf Features

Waterproofs—Because its chemicals fill the pores and thus repel water.

Densifies—Because it lubricates and reduces friction between aggregates.

Quick-sets—Because it hastens and more perfectly completes the chemical reaction of the cement with the water.

Strengthens—Because it compacts and solidifies by causing less porosity. Tests prove that compressive strength of Acqua-Pruf concrete is in excess of 25% above untreated concrete.

Acid-Resistant—Because of the flint-like finish, obtained by troweling Acqua-Pruf treated mortar, the closer knit surface is much less easily penetrated by the action of acid.

Anti-Freeze—Because chemical reaction generates heat sufficient for pouring and setting at 10° F. above zero. Below 20° both water and aggregate should be heated.



Typical Uses of Acqua-Pruf

Footings, Piers, Foundation Walls, Beams and All Bulk Concrete—The simplest method of densifying, strengthening and waterproofing is by means of Acqua-Pruf Liquid Integral—it becomes an integral part of the mix and insures *better concrete*.

Floors—Dustproof, oilproof, acidproof, damp-proof, waterproof. Floors made of Acqua-Pruf treated concrete, when steel troweled, show a surface that will resist the corrosive action of the elements, abrasion and acid and will not need paint, except for color effects. Oil will wash off with water or rain. When properly troweled, the floor surface is *lactic acidproof* for creameries, ice cream, milk and dairy plants; *oilproof* for garages, gas stations and industrial plants; *dustproof* for schools, churches and storage vaults and protection for delicate instruments, as well as the health of employees against silicosis.

Cellar Walls and Floors—May be effectively waterproofed from inside with Acqua-Pruf.

Bases for Machinery—Strength and toughness are the essential elements. The increased tensile strength of Acqua-Pruf treated concrete more than fills these requirements.

Sidewalks, Curbs, Driveways—Can be trowel finished several hours earlier than usual and opened for use in less than one-half the normal time.

Concrete Products—Such as garden furniture, cemetery vaults, caskets and cement coverings, pottery, forms and moulds may be used twice daily—less expansion and contraction—water and dampproof, denser and *better concrete* is produced by the use of Acqua-Pruf.

Mortar and Stucco—Acqua-Pruf produces a fatty mortar, easy to trowel and eliminates the *use of lime*. It waterproofs and prevents to a great extent the efflorescent deposits on brickwork and dampness on the inside of stucco walls.

References

Acqua-Pruf has been on the market over 15 years. Among our many customers are the Phoenix Utility Co., General Electric Co., Navy Department of the U. S. Gov't, Susquehanna Collieries Co., Great Atlantic and Pacific Tea Co., Public Service of N. J., Smith-Green Co., Erie R. R., and Sheffield Farms Co., Inc.

ACQUA-SEAL, A PENETRATING SURFACE PRESERVER

For Brick, Cement, Stucco and Masonry Walls

Acqua-Seal is not a surfacer. No surfacer has been found that will stand up to the ravages of the elements. Lasting results can only be obtained by producing a thick layer of waterproofing *within the pores*. Acqua-Seal does this.

Efflorescence is caused by moisture penetrating into the pores of brick, thus dissolving the chemicals of which the brick or masonry is composed and later evaporation, causing deposit of salts on face of building. Acqua-Seal treated walls are free and remain free of efflorescence.

Acqua-Seal preserves brick and concrete structures from pock-marks, spalling off, caused by water getting into the pores and freezing—also keeps soot and dirt from filling the pores



and spoiling the beauty of the architectural finish.

Acqua-Seal obviates the use of sizing and waterproofs the plaster. It also prevents water-blotches on interior plaster walls by sealing the pores and the preservation of the decorative finish is assured.

Covering Capacity—Depending on the porosity of the structure, a rough estimate can be obtained by the following table:

Brick	—75 to 125 sq. ft. per gallon, 2 coats.
Concrete	—80 to 140 sq. ft. per gallon, 2 coats.
Stucco	—80 to 140 sq. ft. per gallon, 2 coats.
Stone	—100 to 160 sq. ft. per gallon, 2 coats.

Specifications for applying will be sent on request.

Other Acqua-Pruf Products

Gran-it—The liquid integral for granite-like concrete. By using 1 part of Gran-it to 17 parts of water, a flint-like surface is produced by steel troweling, impervious to water, dustproof and oilproof for floors.

Acqua-Top—A penetrating surface hardener for unpainted cement floors—applied by brush and has large coverage. By its actual penetration, Acqua-Top assures protection from dust and obviates the need of paint—its effect is lasting.

Acqua-Plastite—The integral for Keene Cement, Plaster of Paris and other plasters—it densifies and allows the application of paint without extreme absorption.

Acqua-Brick and Cement Paint—For waterproofed architectural finishes.

This material waterproofs and produces a desired color effect by one or more applications, depending upon the porosity of the surfaces.

Specifications for use and full details of the above products will be furnished upon request

THE MASTER BUILDERS COMPANY

Specialists in Concrete Floor Construction and Maintenance for 23 Years
CLEVELAND, OHIO

SALES OFFICES IN ALL PRINCIPAL CITIES

FACTORIES IN CLEVELAND, OHIO; BUFFALO, N. Y.; TORONTO, ONT.

Use Metalicron for Heavy Duty Industrial Floors

Metalicron Hardened Concrete Floors are doubly protected floors. Not only are they protected from abrasion but also from the primary cause of floor wear—corrosion from fats, oils, greases, acids and alkalis found on all floor areas to a greater or lesser extent. Although mild, these corrosives etch and roughen the floor exposing the aggregate to abrasive wear.

Doubly Protected—Metalicron is composed of the twenty-three year time tested Master Builders Metallic Hardner plus the unique ingredient, Omicron, discovered in Master Builders Research Laboratories. When Metalicron is troweled into a freshly floated floor, the Metallic Hardner replaces the brittle sand and resists abrasive wear while the Omicron content combines with cement by-products in such a way that it enables the floor to resist acid and alkali solutions. Thus the floor is protected from the two causes of floor wear: corrosion and abrasion.

In addition to being wearproof, Metalicron Floors are waterproof and dustproof.

PITTSBURGH TESTING LABORATORY REPORT NO. 65412

4x2-in. compression cylinders of 1:3 concrete, plain and treated with Metalicron were stored in water and in a corrosive solution of 10% sodium sulphate for periods given. Note comparative resistances to disintegrating action.

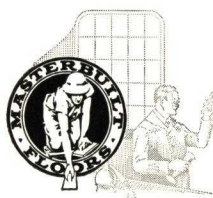
Age, days	Stored in	Comp. str., lb. per sq. in., plain 1 : 3 concrete	Comp. str., lb. per sq. in., 1 : 3 concrete with 20% M't'n	Greater strength of Metalicron concrete over plain
90	Water.....	3233	4857	50.2%
	10% sod. sul.	2437	4683	92%
	Pct. loss from chemical attack	24%	4%	

For Heavy Duty—Metalicron Floors may be installed as new floors or as a resurfacing for old floors. They are designed to give maximum resistance to corrosive and abrasive wear found in all industry from milk plants to freight stations, from canneries to automobile factories.

Approval—Metalicron has the approval of America's largest industrials, including Ford, U. S. Steel, Standard Oil, Du Pont, Firestone, General Electric, Continental Can, Texas Oil and hundreds of others.

Over 24,000,000 sq. ft. of Metalicron-protected Floors are giving daily evidence of their unusual ability to resist both wear and corrosion.

Quantity Required—For average duty floors, 30 lb. of Metalicron per 100 sq. ft. For heavy duty, 40 lb. per 100 sq. ft. For extra heavy duty, 50 lb. required per 100 sq. ft.



Colored Metalicron Floors—Metalicron Floors may also be obtained in ten colors. Send for color chart.

Specification—All cement floor finish shall be hardened and protected from corrosion and abrasion by Master Builders Metalicron using (here insert "30 lb." for average traffic, "40 lb." for heavy traffic or "50 lb." for extra heavy traffic) of Metalicron per 100 sq. ft.

Use Master Mix for Brewery, Bottling, Food Products Floors, etc., Subject to Moisture and Corrosives

Master Mix is a semi-liquid chemical hardener to be added to the gauging water, cement and aggregates. It permanently increases strength, waterproofs and dustproofs. Master Mix Floors are designed for light industrial or heavy commercial building traffic, and for floors subject to acidic liquids or considerable moisture.

Permits Low Water Cement Ratio—Due to its Omicron content, Master Mix greatly improves the workability of the cement mortar thus permitting low water cement ratios for added strength and decreased porosity—4½ gal. of water per bag of cement may be used without cement finishing being made difficult.

Hardens Throughout Topping—Master Mix hardens a cement floor throughout the entire thickness of the topping.

Dustproofs and Waterproofs—A Master Mix floor is dustproof due to the density provided by increased hydration of the cement particles and the added cementitious products due to the action of Omicron.

Specification—All concrete floor finish as designated shall be hardened with Master Builders Master Mix used in the proportions of 1 qt. of Master Mix for every bag of cement mixed. For Floors subject to acid solutions, use 2 qts. of Master Mix for every bag of cement, followed by application of Saniseal or Concrete Preservative—see below.

Waterproofings

Concentrated Integral Waterproofings—In three forms—liquid, paste and powder—and are of the powerful stearate type recommended by all authorities. Send for complete data.

Colored Omicron Waterproofing—A pure stearate colored liquid waterproofing. For coloring, waterproofing, strengthening and plasticizing masonry mortars, stucco and plaster.

Metallic Waterproofing—Iron method—to waterproof against pressure. For repairing cracked and spalled concrete, waterproofing vats, tanks, etc.

Masterseal—Colorless surface waterproofing. Masterseal is a colorless liquid for waterproofing the exterior surface of brick, stone, concrete and plaster walls, whether wet or dry. 1 gallon covers up to 400 sq. ft., brush or spray.

Maintenance

Embeco—Special metallic aggregate for grouting bed plates, etc. of heavy machinery. Also recommended for loading docks; foundations for machines, pointing up basement walls; grouting bolts, dead-eyes, etc. in concrete floors; cementing cracks, or sealing openings around pipes; grouting in rails; patching floors; grouting brick or stone pavement. Gives 7 day strength in 24 hours. 100% stronger than plain cement grout. Makes grouts last three to four times longer.

Concrete Preservative—A liquid of a nonvolatile waterproofing and synthetic base. Concrete Preservative protects concrete from the attack of reagents which ordinarily cause rapid deterioration, such as solutions of alkalis, acids and salts. It waterproofs the concrete preventing penetration through from above or from below. Is an excellent alkali-resisting priming coat for oil paints to be used on concrete or masonry as it waterproofs, forming a strong bond between paint and concrete and prevents blistering and peeling.

Quickfix Methods of Patching—Quickfix methods have been developed over a period of twenty-one years' experience with maintenance problems. They are three in number and cover all patching conditions. Quickfix Metallic Patcher—Quickfix Hard Patcher—Quickfix Plastic Patcher.

Saniseal Surface Hardener—Saniseal deposits a hard, wear resistant crystal in the pores of the floor which hardens and dustproofs the surface. Saniseal is highly concentrated. Recommended for floors already in place. For new floors, an integral hardener (such as Metalicron or Master Mix—see above) is recommended.

Mastertex—Waterproof Cement Paint in Colors—For waterproofing and decorating brick, concrete, unglazed tile, stucco and plaster surfaces. Contains no volatile elements, such as glue, oil, casein, etc., and consequently will not brush off, blister, chip or peel when exposed to the elements. Applied to wetted surfaces. Excellent for inside "mill white" where walls are moist.

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company
61 Broadway, NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, MASS. CHICAGO, ILL. CINCINNATI, OHIO CLEVELAND, OHIO DETROIT, MICH. INDIANAPOLIS, IND.
KANSAS CITY, MO. PHILADELPHIA, PA. PITTSBURGH, PA. ST. LOUIS, MO. SYRACUSE, N. Y.

SOLVAY CALCIUM CHLORIDE FOR CURING, DENSIFYING AND ACCELERATING THE SETTING OF CONCRETE IN STRUCTURES AND PAVEMENTS

Also for Highway Dust Prevention, for Removing Ice from Streets and Highways, and as a Safe Refrigerating Brine Medium

The Material

A white, dry, flaky product which when added to the mixing water accelerates the initial hardening of concrete; at the same time densifies the concrete, making it more waterproof. The early strength produced by Calcium Chloride aids the fresh concrete to resist freezing in low temperatures. Solvay Calcium Chloride is extremely hygroscopic and dissolves almost instantly in water.

It can be used with any brand of portland cement.

Accelerating Effect

As shown by tests, concrete gauged with Solvay Calcium Chloride at the end of 48 hours has the same strength as concrete gauged with plain water has at the end of 7 days.

For Concrete in Structures

Early removal of forms, speedier and better finishing, and protection against freezing weather, are advantages afforded through the accelerating action of Solvay Calcium Chloride, proved by authoritative tests made by U. S. Bureau of Standards, American Society for Testing Materials, Portland Cement Association, U. S. Engineers, Lewis Institute, and others. For full information send for book, "Solvay Calcium Chloride in Concrete Construction."

Floor Finishing

The accelerating effect of Solvay Calcium Chloride and the great early strength it gives concrete makes possible the finishing of concrete floors the same day they are poured, saving overtime labor costs. A better wearing surface is produced by the use of Calcium Chloride as an admixture.

Cold Weather Concreting

The qualities of quick initial setting, hardening, densifying, and protecting concrete against freezing temperatures, make it possible to progress with concrete work in continued cold weather when using Solvay Calcium Chloride.

For Curing Concrete Pavements

Calcium Chloride has proved a valuable asset as a curing and accelerating agent in concrete paving operations. Materially reduces the curing period. Eliminates earth and straw covering, ponding, and old-fashioned methods.

For full information on this important subject send for the free booklet, "Modern Methods of Curing Concrete Highways." Contains information derived from



reports issued by such authorities as the U. S. Bureau of Public Roads, the Highway Research Board of the National Research Council, and others.

Success established through many years of practical use and tests conducted by unquestioned authorities.

For Highway Dust Control

Solvay Calcium Chloride keeps down dust on dirt and gravel-type roads by keeping the surface moist. Surface binding action of Solvay Calcium Chloride holds material in place and saves costly replacements and labor. Often pays for itself in replacements saved. No stains. No tracks. No odor. Solvay Calcium Chloride is clean, white, and harmless. Can be applied by unskilled labor. Used and recommended by highway authorities throughout the country. Economical. For detailed information send for booklet, "Dustless Roads, How to Maintain Them."

For Controlling Ice on Streets and Highways

For combating the dangers faced by traffic on icy, slippery streets, highway departments in all sections have achieved excellent results by the use of sand or cinders treated with Solvay Calcium Chloride. The use of Calcium Chloride treatment is endorsed by the American Road Builders' Committee on Snow Removal and Equipment, by auto clubs, safety organizations, and highway authorities.

The Safe Refrigerating Brine Medium

Solvay Calcium Chloride is the ideal *safe* refrigerating brine medium. Guaranteed free from magnesium chloride and harmful impurities. Prevents corrosion and clogging in brine lines. Send for practical handbook on refrigerating brines. Contains useful information in handy form for ready reference.

Cost and Shipment

Solvay Calcium Chloride is inexpensive and economical to use.

Solvay Calcium Chloride is shipped in metal drums containing 400 lbs. net and in moistureproof bags containing 100 lbs. net. Stock is carried in 100 cities in the United States. Special arrangements for handling carload lots.

Technical Service

THE SOLVAY PROCESS COMPANY maintains a Technical Service Department whose services are gladly rendered without charge.

NATIONAL FIREPROOFING CORPORATION

GENERAL OFFICES

Fulton Building, PITTSBURGH, PA.

BRANCH OFFICES

NEW YORK, Chanin Building

CHICAGO, Builders Building

PHILADELPHIA, Architects' Building

BOSTON, Textile Building

BIRMINGHAM, ALA. (NORTH BIRMINGHAM)

IN CANADA: THE NATIONAL FIREPROOFING COMPANY OF CANADA, LTD., TORONTO, ONTARIO

For Natco Clay Conduit, see Manufacturers' Index

The NATIONAL FIREPROOFING CORPORATION operates 22 plants in 17 different localities, in close proximity to the principal tile markets of the country. In addition, it operates a plant in Hamilton, Ontario. Over 5000 acres of clay deposits are owned or leased. These deposits are estimated to contain not less than 56,000,000 recoverable tons of clay, which, at the corporation's production capacity of one million tons a year, would last for over half a century.

The Natco Line of Structural Clay Tile comprises units to meet every building need, in structures of every kind. The tile is made from special clay, mined

TRADE
NATCO
MARK

and molded into scientifically designed shapes that combine maximum strength with minimum weight. These shapes are dried and then kiln burned in temperatures of over 2000°, giving a product that is permanent, strong and fire-safe.

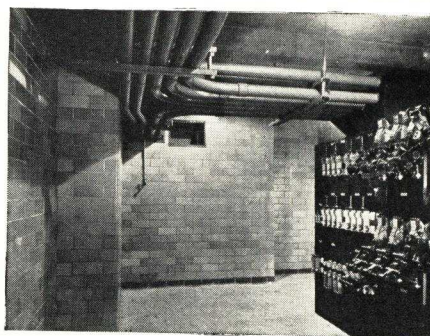
All of the corporation's tile is branded with the trade name Natco. Many shapes are available in double shell design, which increases the insulating properties of the ware.

An adequate and efficient Engineering Department is maintained, which is ever ready to co-operate with you in solving your tile problems.

NATCO VITRITILE AND VITRIBRIK

Natco Vitritile and Vitribrik are building units which make it possible to construct strong, insulated, vermin-proof, fire-safe walls, with finished faces which require no painting, plastering, or decorating of any sort, then or ever.

The finish is glass-hard and glass-smooth, affords no foothold for dirt, and effectively resists damage from grease, chemicals, and heat. The wall may be easily cleaned and kept clean.



Vitritile and Vitribrik find their fields of use in any application where attractiveness, sanitation, and resistance to defacing or corrosive agents must be combined with reasonable first cost and low maintenance. The walls of chemical laboratories; the corridors of plant hospitals; the walls of wash rooms; the wainscot of plant restaurants and kitchens; the walls of garages; and applications of similar natures, will find Vitritile and Vitribrik an answer to many pressing problems, previously unsolved. A comprehensive line of fittings, such as closures, cove base, wainscot cap and so on are available for both Vitritile and Vitribrik. A few typical units are shown on the following page. These are all that are needed for ordinary construction problems. If any conditions are encountered where the units shown are not sufficient, literature showing the complete line of fittings will be gladly sent.

The Engineering Department of the Corporation will gladly co-operate in working out construction methods that will meet your problems.

Natco Vitritile

Natco Vitritile should be used where a wide choice of colors and finishes is desired, and where the highest quality is sought. A wide variety of shade ranges is available, including full and partial buff shades, light

buffs with mottled surfaces, cream overtones with delicate green base color, cream overtones with a pleasing buff base color, mat finished whites, and soft, pleasing blacks.

Vitritile has been used by leading architects in some of the finest buildings in the country, and has repeatedly demonstrated its utility and economy. It offers wide latitude in color design. The walls may be constructed throughout of one shade or range, or different ranges may be selected for trim. Color sheets showing the various shade ranges available will be sent on request.

Natco Vitribrik

Natco Vitribrik Series "N"—Offers all the practical advantages of Vitritile but is in 8-in. units. It is available in the two most popular Vitritile shades: 2060 (a range shading from buff to golden tan), and 1000 (a close range of light buff shades with mottled surfaces). As the unit drawings on the following page show, the standard stretcher unit is only 7¾ in. long, as compared to 12-in. length of Vitritile. The applications for Series "N" Vitribrik are similar to those for Vitritile, except that it cannot be used where a choice of a wide range of color effects is desirable.

Natco Vitribrik Series "K"—A double brick size unit for interior and exterior walls. It is furnished in one range only—warm, rich, light golden tans. It can of course be used for either interior or exterior, load-bearing or non-load-bearing walls and partitions, and provides a low maintenance finished face; permanent strength; insulating quality; fire-safety; and other advantages which Vitritile and "N" Series Vitribrik possess. Walls built of it are attractive, but it is not generally used in applications where decorative effect is the prime objective.

A FEW TYPICAL UNITS FROM THE NATCO VITRITILE AND VITRIBRIK LINE

VITRITILE SHAPES

The drawings of the Vitritile, and the "N" and "K" Series Vitrabrik shapes indicate the basic differences in design. The fittings shown on the lower half of the page are, in general design, essentially the same for both Vitritile and Vitrabrik. The dimensions are carried in tables below. It should be understood that the shapes and fittings shown merely indicate the complete line. The units shown, however, will take care of all ordinary situations. A complete list of shapes available will be furnished you if you require additional units for any specific job.



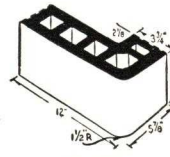
V-400

3 3/4 x 5 x 12-in. Wall Stretcher (smooth two sides). Also furnished in 4, 5 1/2, 8, and 10-in. lengths



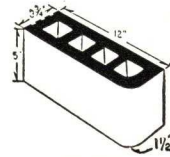
V-4000

3 3/4 x 5 x 12-in. Wall Stretcher (smooth one side, scored one side), also furnished in 4, 5 1/2, 8 and 10-in. lengths



V-4110

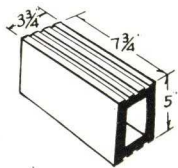
3 3/4 x 12 x 5-in. Bullnose External and Square Internal Corner. Also supplied in Square Internal and External Corner (V-4100)



V-430

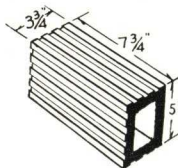
3 3/4 x 12 x 5-in. Single Bullnose Full Closure. Also supplied Double Bullnose (V-440) or Square (V-420)

"N" SERIES VITRIBRIK SHAPES



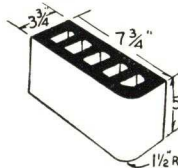
N-400

3 3/4 x 5 x 7 3/4 Wall Stretcher smooth two sides



N-4000

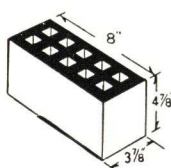
3 3/4 x 5 x 7 3/4 Wall Stretcher smooth one side, scored one side



N-430

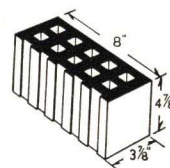
3 3/4 x 5 x 7 3/4 Bullnose Closure smooth two sides

"K" SERIES VITRIBRIK SHAPES



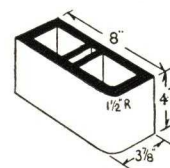
K-400

3 3/4 x 4 7/8 x 8 Wall Stretcher smooth two sides



K-4000

3 3/4 x 4 7/8 x 8 Wall Stretcher smooth one side, scored one side

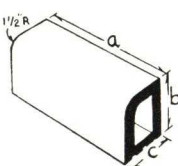


K-430

3 3/4 x 4 7/8 x 8 Bullnose Closure smooth two sides

FITTINGS FOR VITRITILE (V-) AND FOR "K" (K-) AND "N" (N-) VITRIBRIK

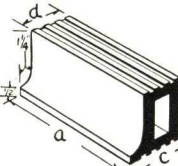
(Illustrations show general design. Tables or captions show dimensions. The prefix "V" (as in V-400, V-K4701, etc.) designates Vitritile. The prefix "K" (as in K-460, K-K4701), and "N" (as in N-460, N-K4701), designate, respectively, "K" Series and "N" Series Vitrabrik.)



460

Single Bullnose Sill or Lintel Tile

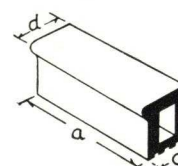
No.	a	b	c
V-460.....	12	5	3 3/4
K-460.....	8	4 7/8	3 3/4
N-460.....	7 3/4	5	3 3/4



470

Single Cove Base Also supplied in Double Cove in "V" and "N" Series.

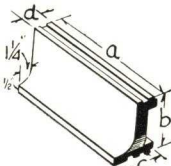
No.	a	b	c	d	e
V-470.....	12	5 1/2	5	3 3/4	1 1/2
K-470.....	8	5 1/2	5 1/2	3 3/4	1 1/2
N-470.....	7 3/4	5 1/2	5	3 3/4	1 1/2



480

Single Wainscot Cap Also supplied in Double Caps

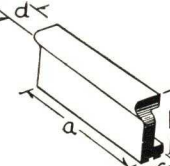
No.	a	b	c	d
V-480.....	12	5	3 3/4	4 1/2
K-480.....	8	4 7/8	3 3/4	4 1/2
N-480.....	7 3/4	5	3 3/4	4 1/2



K4701-R

Furring Cove Base Coped right. (Coped left hand opposite)

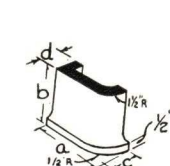
No.	a	b	c	d
V-K4701-R	12	5 1/2	3 3/4	1 1/2
K-K4701-R	8	5 1/2	3 3/4	1 1/2
N-K4701-R	7 3/4	5 1/2	3 3/4	1 1/2



K4801-R

Furring Wainscot Cap Coped right. (Coped left hand opposite)

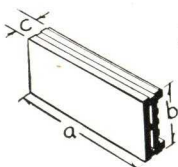
No.	a	b	c	d
V-K 4801-R	12	5	1 1/2	2 5/8
K-K 4801-R	8	4 7/8	1 1/2	2 1/2
N-K 4801-R	7 3/4	5	1 1/2	2 5/8



S4751-L

Furring Cove Base, Bullnose Closure left hand. (Right hand opposite)

No.	a	b	c	d
V-S 4751-L	7 1/2	5 1/2	3 3/4	1 1/2
K-S 4751-L	7 1/2	5 1/2	3 3/4	1 1/2
N-S 4751-L	7 1/2	5 1/2	3 3/4	1 1/2

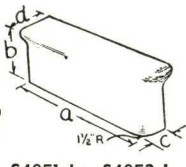


4900-2000

Furring Stretcher

No.	a	b
V-4900.....	12	5
K-2000.....	8	4 7/8
N-2000.....	7 3/4	5

No.	c
V-4900.....	1 7/8
K-2000.....	1 15/16
N-2000.....	1 7/8

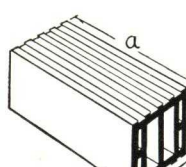


S4851-L; S4852-L

Furring Wainscot Cap, Bullnose Closure (Right hand opposite)

No.	a	b
V-S 4852-L	12	5
K-S 4851-L	6 1/2	4 7/8
N-S 4851-L	5 7/8	5

No.	c	d
V-S 4852-L	1 7/8	2 5/8
K-S 4851-L	1 15/16	2 1/2
N-S 4851-L	1 7/8	2 5/8



600-6000; 800-8000

Wall Stretcher; 600 and 800 smooth two sides (furnished in Vitritile only); 6000 and 8000 smooth one side, scored the other (furnished in both Vitritile and Vitrabrik).

No.	a	b	c
V-600; V-6000.....	12	5	6
K-6000 only.....	8	4 7/8	6
N-6000 only.....	7 3/4	5	6
V-800; V-8000.....	12	5	8
K-8000 only.....	8	4 7/8	8
N-8000 only.....	7 3/4	5	8

V-600, V-6000, V-800 and V-8000 units (note that these are Vitritile only) are also furnished in 4, 5 1/2, 8 and 10-in. lengths.

TYPICAL WALL CONSTRUCTION DETAILS

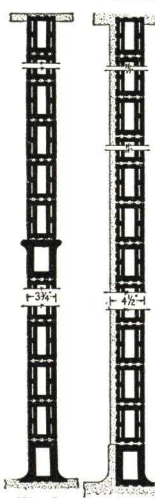


Fig. 2

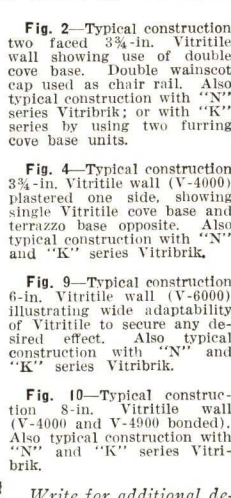


Fig. 4

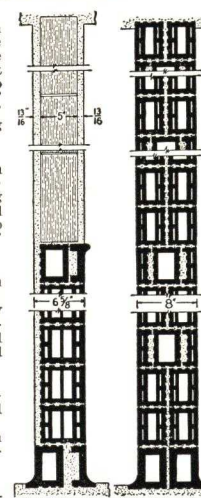


Fig. 9

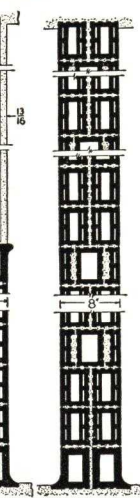


Fig. 10

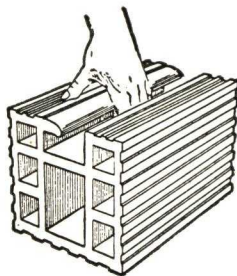
Write for additional details or other information.

NATCO SPEED TILE

(Licensed under Wheeler Patent 1803158)

Natco Speed Tile is a load-bearing structural clay tile unit, suitable for interior or exterior walls. A projecting lip provides a smooth, convenient handle for handling, which promotes great speed in laying. Conservative estimates show a saving of from 15 to 30 per cent in laying time.

A variety of shapes and sizes are provided, in various finishes, permitting the



rapid construction of finished face walls (either textured or rock face finish); brick faced walls with full bond; and stucco walls.

Through the use of Natco Speed Tile, low cost and rapid laying can be united with permanence, resistance to decay and corrosion, fireproof properties and high structural strength.

TYPES, SIZES AND FINISHES OF NATCO SPEED TILE UNITS



No. 8. 8-in. Wall Stretcher

7 $\frac{3}{4}$ x 7 $\frac{3}{4}$ x 12 in. Weight, 24 lbs. 1.4 tile per square foot. Furnished scored, unglazed for stucco exterior and plaster interior; scored one face for stucco exterior and smooth interior, or smooth two faces for smooth exterior and interior walls



No. 8. Header Unit

7 $\frac{3}{4}$ x 7 $\frac{3}{4}$ x 12 in. Weight, 22 lbs. 1.5 tile per square foot. Interior face scored for plaster



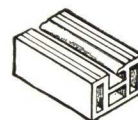
No. 8-A. 8-in. Closure Tile

7 $\frac{3}{4}$ x 7 $\frac{3}{4}$ x 7 $\frac{3}{4}$ in. Weight, 16 lbs. Furnished scored. This unit complete, or split in half, is used as closure, jamb block, and so on, in conjunction with No. 8

No. 8-8-16. Wall Stretcher (Not Illustrated)

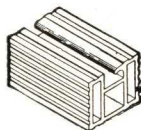
Sample on request

Weight, 32 lbs. 1.05 tile per square foot. This unit is generally used for foundation walls. Furnished in textured face, with smooth glazed interior surface; or rock face with smooth glazed interior surface. Design assures water-tight joints. Fittings listed below under rock faced building tile, can be used with these units. They will be furnished with either a rock or tex face



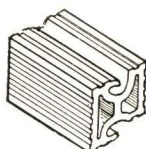
No. 5. 8-in. Wall Tile

7 $\frac{3}{4}$ x 5 x 12 in. Weight, 16 lbs. 2.1 tile per square foot. Furnished scored both faces for stucco exterior and plaster interior; furnished scored one face for stucco exterior and smooth interior; furnished smooth salt glazed, for finished exterior or interior walls. A No. 5 tex face unit is furnished in 8x5x12 size. Furnished with textured face, and interior face scored for plaster, for finished exterior walls. A full line of fittings is available for this tex face unit



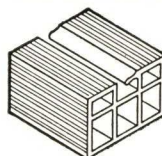
No. 6. 8-in. Wall Tile

7 $\frac{3}{4}$ x 6 $\frac{1}{4}$ x 12 in. Weight, 18 lbs. 1.71 tile per square foot. Furnished scored for stucco exterior and plaster interior. In conjunction with a hollow brick unit, this stretcher can be used to build bonded brick faced walls. Furnished in Chicago district only



Speed-A-Backer (Patented)

7 $\frac{3}{4}$ x 7 $\frac{3}{4}$ x 12 in.; 7 $\frac{3}{4}$ x 7 $\frac{1}{2}$ x 12 in.; 7 $\frac{3}{4}$ x 7 $\frac{1}{8}$ x 12 in., for building 12-in. walls in combination with brick. Other thicknesses of units are available, in the three designated heights for building 14 and 16-in. walls. Faces are scored for plaster interior. A two-cell unit (illustrated) is provided for New York City, a three-cell unit for the balance of the Eastern District. These Speed-A-Backers are the only unit required on the scaffold to build complete backing walls



No. 128. 12-in. Wall Stretcher

11 $\frac{3}{4}$ x 7 $\frac{3}{4}$ x 12 in. Weight, 32 lbs. 1.4 tile per square foot. Furnished scored for stucco exterior and plaster interior; furnished smooth unglazed for finished interior walls

No. 108. 10-in. Wall Stretcher (Not Illustrated)

9 $\frac{3}{4}$ x 7 $\frac{3}{4}$ x 12 in. Weight, 28 lbs. 1.4 tile per square foot. Furnished scored for stucco exterior and plaster interior; and smooth unglazed for finished interior walls. Header also furnished. Weight, 26 lbs.

No. 128. Header (Not Illustrated)

11 $\frac{3}{4}$ x 7 $\frac{3}{4}$ x 12 in. Weight, 29 lbs. 1.4 tile per square foot. Furnished in Chicago district only walls, plaster interior

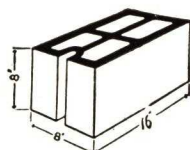
NATCO ROCK FACED BUILDING TILE

Natco Building Block is adapted to a wide variety of industrial uses. Its rugged, attractive face simulates hand-hewn rock. Its reverse side is a smooth glazed surface, sanitary, easily cleaned, and permanently attractive. The units are absolutely non-inflammable and resistive to heat. They prevent fires, help to confine



them if they start, and afterwards permit maximum salvage.

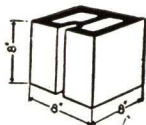
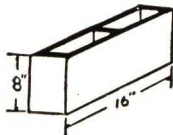
These units are widely used for foundations, but are also extremely satisfactory for a wide variety of industrial building. The fittings, shown below, can also be used in conjunction with the 8-8-16 speed tile unit described above.



Combination Corner Block and Full Jamb for Steel Sash

Below:

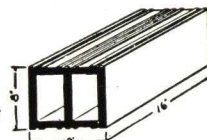
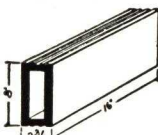
3 $\frac{3}{4}$ x 16 x 8-in. Closure Tile



Half Jamb Tile for Steel Sash

Below:

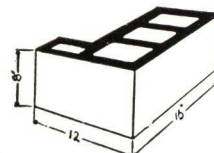
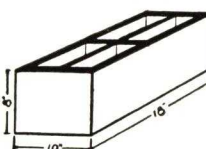
3 $\frac{3}{4}$ x 8 x 16-in. Joist and Wall Tile



10x8x16-in. Wall Tile
12x8x16-in. Wall Tile is also available

Below:

10x18x8-in. Corner



12x16x8-in. Corner

Standard short lengths—6, 4, 2 and 1-in. lengths are available.

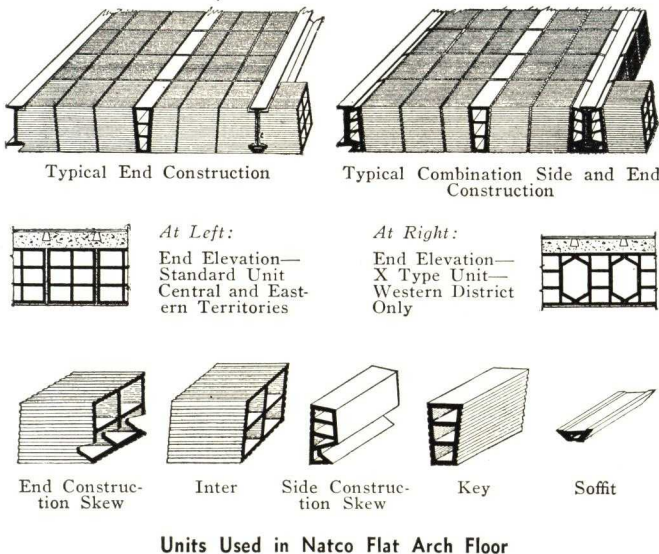
NATIONAL FIREPROOF FLOOR SYSTEMS

The floor systems described below all possess a high degree of strength, dependability and fire-safety. Each has individual characteristics which make it particularly applicable to certain types of installations, or to certain conditions which may be encountered in laying. Space permits only a general discussion of the characteristics of each type. Tables of safe loads, and similar data, are available to anyone interested. The Engineering Department of the Corporation will gladly co-operate with you in working out any specific floor problem.

Natco Flat Arch Floors

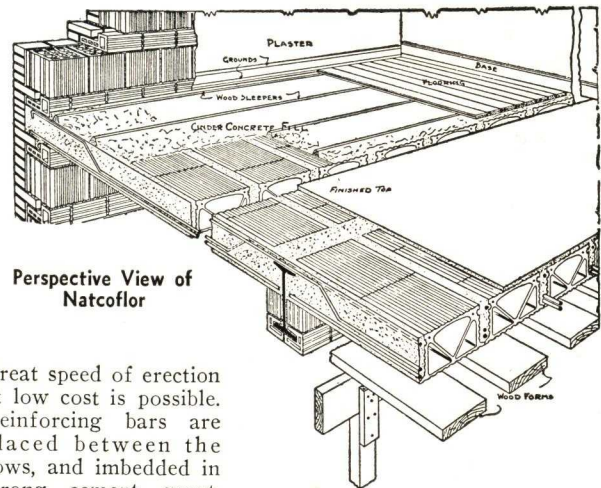
These floors may be installed very rapidly, regardless of temperature. They are thus ideal for winter construction. Centering is hung. No nails are used, so there is no timber loss, and the floors below remain clear for other trades. Centers need remain in place only one-tenth to one-quarter as long as is required with concrete construction, and can then be transferred to upper floors. Holes may be cut out any time, or tile units omitted during the laying for pipe work. The all-tile ceiling provides an ideal plaster base.

Two types are available—end construction, or combination side and end construction. Units consist of a side or end construction skew; inters; keys; and soffits. Units for floors 8, 9, 10, 12 and 15 in. deep and for any span, are available.



Natcoflor

The Natcoflor system is built with a special tile with projecting lips, which are placed in contact. The units are thus self-aligning, and provide an all-tile ceiling for plastering.

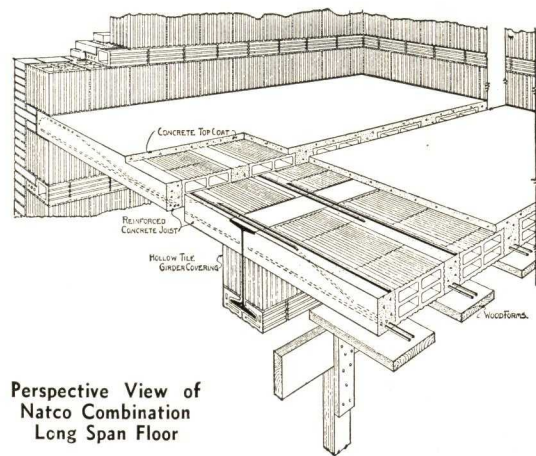


Perspective View of Natcoflor

Great speed of erection at low cost is possible. Reinforcing bars are placed between the rows, and imbedded in strong cement grout. An extremely strong floor results, 2 to 4 in. less in depth than common floors of similar strength. No concrete or other topping is required for structural strength. The tile itself carries the compressive stresses. Any desired type of finished floor can be used. Construction is strictly fireproof. Units are available in various depths: 4, 5, 6, 7, 8, 9, 10, 11, and 12 in.

One-way Combination Long Span Floor

A standard long-span floor construction. Tile fillers make permanent forms, around which are cast a series of connected concrete "T"'s. Tests have shown that the tile shells bear part of the compressive stresses. Units are available for various depths of floor.



Perspective View of Natco Combination Long Span Floor

NATCO GIRDER AND COLUMN COVERING

Steel columns and all girders and beams projecting below a floor slab should be protected by at least 2 in. of fireproofing material. This often requires a large amount of expensive forms, and necessitates much heavy concrete work, which increases building costs and makes the deadload greater.

Experience has repeatedly proven that well burned hollow tile has no equal for fireproofing girders and columns.

A wide variety of units, to fit all of the fireproofing problems ordinarily encountered, is available. The sketches shown, however, indicate how the fireproofing is handled in the types of construction that are most frequently used. Clip and angle tile are used around the beam flange, and hollow tile units serve as fillers.

Standard clip and angle tile to fit all standard beams are available. A table showing these standard shapes will be sent on request.

The Engineering Department will co-operate with you at any

time, in working out the best method of fireproofing beams in your buildings.

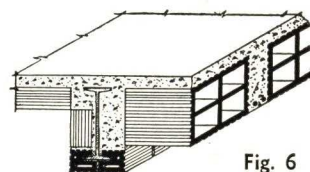


Fig. 6

Shows method of using tile fireproofing with long span concrete joist floor construction. It is economical either with structural tile or metal pan filler in the floor. You will note that the covering is put in place before the floor is poured and that the concrete of the joist fills the cells of the tile and bears directly on the flange of the beam.

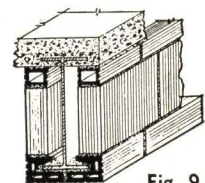


Fig. 9

Fireproofing with concrete slab floor construction. Note the extreme saving in dead load on these large girder beams due to the hollow construction. These beams are often covered after the floor is in place, thus permitting the use of the bottom flange to support floor forms.

NATCO SEGMENTILE

For Circular Storage or Insulating Structures

Natco SegmenTile is a double shell, fire clay structural unit, 6 in. thick, with a 12x12-in. face. A channel is molded in the top of each unit to receive reinforcing steel. The units are used for constructing storage bins for minerals, sand, ashes, coal and other materials, and for insulating and protecting oil tanks.

Note these small air cells in both inner and outer faces—the exclusive double-shell feature of Natco—that clinch and firmly hold all vertical mortar joints. This exclusive feature gives superior structural strength to a Natco bin as well as making for rapid erection.

Deep and wide channels provide extra large space for reinforcing steel within the wall of the bin, and not in the mortar joints between the courses of tile.

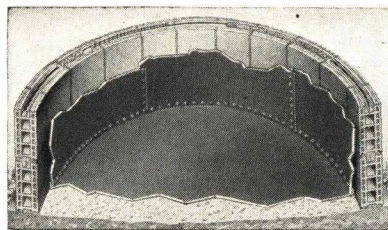
Strong bands of reinforcing steel in each course and every foot in height easily bent to conform to curve of bin—no loose or rusty hoops to care for.

The greatest possible number of still air spaces that provide the excellent insulative qualities of a Natco wall.

Natco scoring assures an effective mechanical bond that grips all cement mortar used in the construction.

The glazed exterior and interior of a Natco wall will not absorb moisture—smoothest of surfaces that allows free movement of grain and prevents collection of dust.

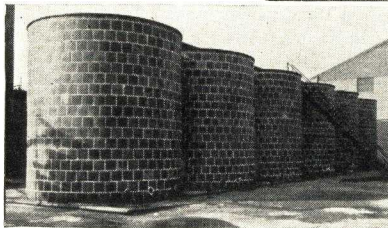
The structures built have extreme strength, and have housed materials weighing as much as 120 lbs. per cubic foot; are fire-safe, never rust, rot, warp or disintegrate; have excellent insulating value; are light enough for



Above:
Cross-Section Showing Two Courses SegmenTile Used to Protect on Oil Tank

Note curvature in wall. Ends are cut to any radius depending on diameter

At Left:
Battery of Six Tanks for Hot Stock, Enclosed with Natco SegmenTile

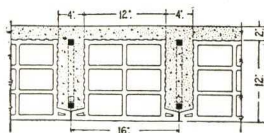


easy handling; and never require painting or other maintenance. The salt glaze finish is resistive to all corrosive action. The illustration shows methods of construction, and one application.

The Engineering Department will furnish construction details, and evidence of successful use in many applications, upon request.

NATCO LIP TILE FOR DRY KILN CONSTRUCTION

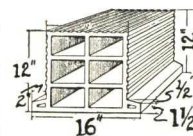
These tile provide an ideal material for dry kiln construction, because of their high insulating qualities, their demonstrated durability, their low moisture absorption, and their fire-proofing possibilities. The projecting lips of the tile form an all-tile roof, and leave uniform forms for casting the concrete joist. No concrete, which might spall, or cause condensation, is exposed. The units are furnished for 8-in. and 12-in. roofs. Engineering data on request.



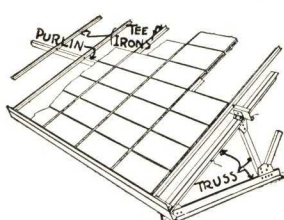
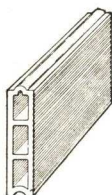
2-in. Combination of Natco Lip Tile and Reinforcing Concrete
Note the smooth, insulated, all-tile ceiling

At Right:
12x16x12-in. Natco Lip Tile for Roof Construction

At Left:
Typical Roof Section of a 12 Plus



NATCO BOOK TILE FOR NON-SPALLING ROOFS



At Extreme Left:
Standard Book Tile

At Left:
Book Tile in Place on Structural Steel Roof Construction

These tile—called "Book" tile on account of their shape—are designed especially for roofs which are to be covered with concrete, tar, felt or any composition. They are uniformly hard burned, are 3 in. thick, and of a length depending upon the weight to be carried.

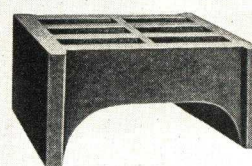
As the tile are non-spalling, and permit a minimum of condensation, they are invaluable for the roofs of glass houses and similar applications where any disintegration of the surface or moisture drip might pollute or injure the product. Write for full engineering data.

NATCO ARCH FILTER BLOCKS FOR TRICKLING FILTER SYSTEMS

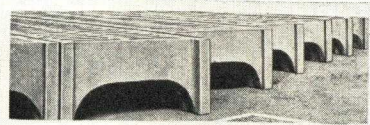
These blocks provide an extremely inexpensive means of constructing trickling filters for sewage, or other disposal systems.

They assure proper aeration; afford maximum run-off without the construction of channels or troughs in the base; are easily cleaned; can be quickly and cheaply installed; have strength many times in excess of requirements; are economical in first cost; and are permanent. They are resistive to any of the corrosive substances or vapors ordinarily encountered in disposal work.

Full engineering details on request.



Filter Block Unit
12x9x6 in. Average absorption 2%



Base Line View Showing Ample Run-off Capacity and Large Air Intake
Note that units are set without mortar

NATCO ROOFING TILE AND FACE BRICK

The Eton shingle tile is 7x15 in., and is laid 6 in. to the weather. It is furnished in a full range of colors, in either the rough or smooth texture. It provides an ideal roof in industrial buildings where appearance is a factor, as it assures lifetime permanence, complete fire-safety, and complete freedom from painting or similar maintenance. The tile is made in the Birmingham plant.

Prices, engineering data, details of fittings, and so on will be furnished on request.

Natco Face Brick

Natco Tex Finish Face Brick, a high quality brick at reasonable cost, is manufactured in the Port Murray, N. J., plant of the Corporation.

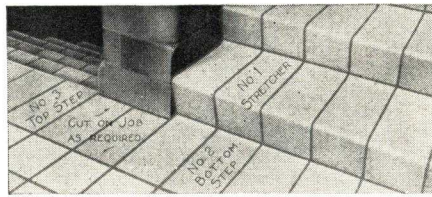
NATCO BULLDOG STAIR TREAD

In the past, almost every stair job has involved special fabrication, because the stair material in general use has been slabs or plates. The new Natco Bulldog Stair Tread provides a standard construction unit, which gives the greatest latitude so far as design is concerned, greatly simplifies the job of stair designing, and effects sizable economies in construction and maintenance.

The Natco Stair Tread is made of hard burned structural clay tile. It is furnished in pleasing buff shades. It has a high coefficient of friction which makes it slip-proof; and this slip-proof property is uniform throughout the tile, and so is not decreased by wear. Only a simple underframe, composed of standard steel shapes, is required in erection, which can be handled by but two trades. Each step is coved, eliminating dirt pockets. Strong cleaning compounds do not affect the tile. Localized wear on the tread can be corrected by removing one or two units in each step, rather than by replacing a whole slab.

The units are furnished in two tread lengths—10½ in. and 11½ in. The 10½-in. tread is furnished in 6¼, 6¾ and 7¼-in. heights. The 11½-in. tread is furnished in 5¼, 5¾ and 6¼-in. heights. Bottom and top step units are furnished to lay with the particular size of stretcher selected. The standard width of all units is 6 in. Special sizes of treads can be furnished at an additional cost, quoted on application.

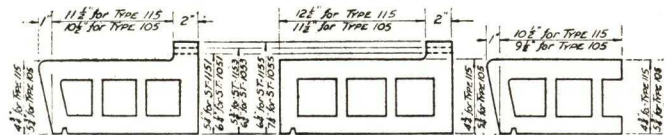
The diagrams show the simple method of erecting the stair. The tables show the wide latitude possible. In using the tables, find—in columns 3, 4 or 5 of the table corresponding to the desired tread—the riser height which you need. Limits including the desired height will be found in at least two columns, and usually in three. Sometimes it will appear twice in one column. In column 2, opposite the suitable riser heights will be found the corresponding total runs. Select the run which fits the particular condition, and your design problem is solved. The limits of slope and sum of rise and tread, covering each unit, is found at the bottom of columns 3, 4 and 5. When either slope or rise plus tread values are limiting factors, find



the column in which the proper value appears, and take your riser height from this column only.

You will note, of course, that any desired variation in individual tread heights can be obtained by varying the thickness of the mortar joint.

The Engineering Department of the Corporation will gladly extend any co-operation desired in assisting you on stair design problems.



Standard Stretcher
Unit No. 1

Furnished in three heights for each of two treads

Bottom Step
Unit No. 2

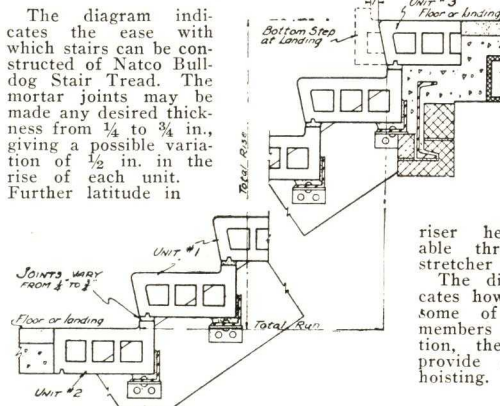
Furnished in three heights in each of two treads to combine properly with stretcher selected

Top Step
Unit No. 3

Furnished in two tread lengths, to combine properly with stretcher used

Special sizes of treads can be furnished at an additional cost.

The diagram indicates the ease with which stairs can be constructed of Natco Bulldog Stair Tread. The mortar joints may be made any desired thickness from ¼ to ¾ in., giving a possible variation of ½ in. in the rise of each unit. Further latitude in



riser height is obtainable through the three stretcher heights available. The diagram also indicates how, by leaving out some of the supporting members during construction, the contractor can provide a hatchway for hoisting.

Detail of Typical Construction

DESIGN TABLES FOR NATCO BULLDOG STAIR TREAD

11½-in. Stair Tread—Table No. 1						10½-in. Stair Tread—Table No. 2					
No. of Treads	Total Run, ft.-in.	No. of Risers	Height of Tile, in.			No. of Treads	Total Run, ft.-in.	No. of Risers	Height of Tile, in.		
			5¼	5¾	6¼				6¼	6¾	7¼
			Joints ¼ to ¾ in.	Joints ¼ to ¾ in.	Joints ¼ to ¾ in.				Joints ¼ to ¾ in.	Joints ¼ to ¾ in.	Joints ¼ to ¾ in.
			Total Rise, ft.-in.	Total Rise, ft.-in.	Total Rise, ft.-in.				Total Rise, ft.-in.	Total Rise, ft.-in.	Total Rise, ft.-in.
1	0-11½	1	0-5½ to 0-6	0-6 to 0-6½	0-6½ to 0-7	1	0-10½	1	0-6½ to 0-7	0-7 to 0-7½	0-7½ to 0-8
2	1-11	2	0-11 to 1-0	1-0 to 1-1	1-1 to 1-2	2	1-9	2	1-1 to 1-2	1-2 to 1-3	1-3 to 1-4
3	2-10½	3	1-4½ to 1-6	1-6 to 1-7½	1-7½ to 1-9	3	2-7½	3	1-7½ to 1-9	1-9 to 1-10½	1-10½ to 2-0
4	3-10	4	1-10 to 2-0	2-0 to 2-2	2-2 to 2-4	4	3-6	4	2-2 to 2-4	2-4 to 2-6	2-6 to 2-8
5	4-9½	5	2-3½ to 2-6	2-6 to 2-8½	2-8½ to 2-11	5	4-4½	5	2-8½ to 2-11	2-11 to 3-1½	3-1½ to 3-4
6	5-9	6	2-9 to 3-0	3-0 to 3-3	3-3 to 3-6	6	5-3	6	3-3 to 3-6	3-6 to 3-9	3-9 to 4-0
7	6-8½	7	3-2½ to 3-6	3-6 to 3-9½	3-9½ to 4-1	7	6-1½	7	3-9½ to 4-1	4-1 to 4-4½	4-4½ to 4-8
8	7-8	8	3-8 to 4-0	4-0 to 4-4	4-4 to 4-8	8	7-0	8	4-4 to 4-8	4-8 to 5-0	5-0 to 5-4
9	8-7½	9	4-1½ to 4-6	4-6 to 4-10½	4-10½ to 5-3	9	7-10½	9	4-10½ to 5-3	5-3 to 5-7½	5-7½ to 6-0
10	9-7	10	4-7 to 5-0	5-0 to 5-5	5-5 to 5-10	10	8-9	10	5-5 to 5-10	5-10 to 6-3	6-3 to 6-8
11	10-6½	11	5-0½ to 5-6	5-6 to 5-11½	5-11½ to 6-5	11	9-7½	11	5-11½ to 6-5	6-5 to 6-10½	6-10½ to 7-4
12	11-6	12	5-6 to 6-0	6-0 to 6-6	6-6 to 7-0	12	10-6	12	6-6 to 7-0	7-0 to 7-6	7-6 to 8-0
13	12-5½	13	5-11½ to 6-6	6-6 to 7-0½	7-0½ to 7-7	13	11-4½	13	7-0½ to 7-7	7-7 to 8-1½	8-1½ to 8-8
14	13-5	14	6-5 to 7-0	7-0 to 7-7	7-7 to 8-2	14	12-3	14	7-7 to 8-2	8-2 to 8-9	8-9 to 9-4
15	14-4½	15	6-10½ to 7-6	7-6 to 8-1½	8-1½ to 8-9	15	13-1½	15	8-1½ to 8-9	8-9 to 9-4½	9-4½ to 10-0
16	15-4	16	7-4 to 8-0	8-0 to 8-8	8-8 to 9-4	16	14-0	16	8-8 to 9-4	9-4 to 10-0	10-0 to 10-8
17	16-3½	17	7-9½ to 8-6	8-6 to 9-2½	9-2½ to 9-11	17	15-9	17	9-2½ to 9-11	9-11 to 10-7½	10-7½ to 11-4
18	17-3	18	8-3 to 9-0	9-0 to 9-9	9-9 to 10-6	18	16-8	18	9-9 to 10-6	10-6 to 11-3	
19	18-2½	19	8-8½ to 9-6	9-6 to 10-3½	10-3½ to 11-1				10-3½ to 11-1		
20	19-2	20	9-2 to 10-0	10-0 to 10-10	10-10 to 11-8						
21	20-1½	21	9-7½ to 10-6	10-6 to 11-4½							
22		22	10-1 to 11-0								
Angle of Slope			25°34' to 27°33'	27°33' to 29°29'	29°29' to 31°20'	Angle of Slope			31°46' to 33°41'	33°41' to 35°32'	35°32' to 37°18'
Sum of Rise and Tread, in.			17 to 17½	17½ to 18	18 to 18½	Sum of Rise and Tread, in.			17 to 17½	17½ to 18	18 to 18½

KEASBEY & MATTISON COMPANY

AMBLER, PA.

BALTIMORE, MD.
BOSTON, MASS.

CHICAGO, ILL.
CLEVELAND, OHIO

DISTRICT OFFICES
DETROIT, MICH.
MILWAUKEE, WIS.
MINNEAPOLIS, MINN.

NEW YORK, N. Y.
AMBLER, PA.

PITTSBURGH, PA.
ST. LOUIS, MO.

For K & M Insulating Pipe Covering, Cements, Etc., see Manufacturers' Index

"Industrial" Corrugated

Composed of asbestos fibre and portland cement scientifically combined and made into rigid, permanent sheets giving great strength.

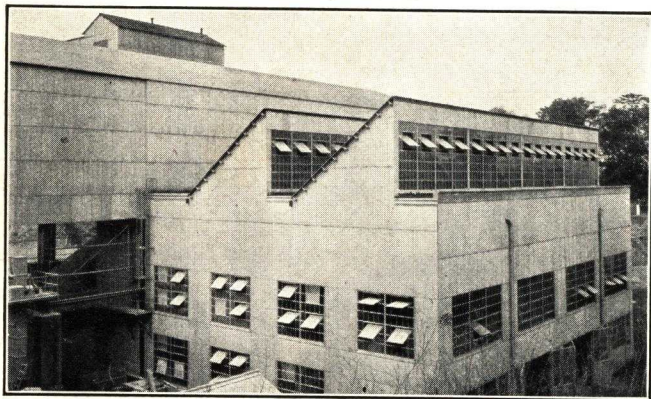
These sheets are furnished in various lengths according to the specifications of the job and in widths of 42 in. They are dense in texture, waterproof and fireproof. They become harder, tougher and more weather-resistant the longer they are exposed to the atmosphere. Two types of Ambler Asbestos Corrugated are available:

1. Industrial Corrugated has a thickness of $\frac{5}{8}$ in. at the ridge, $\frac{3}{8}$ in. in the valley and $\frac{1}{4}$ in. on the slope. There are ten corrugations per sheet, each $4\frac{1}{8}$ in. wide and $1\frac{3}{8}$ in. deep from top surface to bottom surface of the corrugations. The approximate weight is 3.2 lb. per sq. ft. These sheets will be furnished in the plain gray color resulting from the mixture of fibre and cement.

2. The second type of Ambler Asbestos Corrugated is 42 in. wide and is furnished in lengths of from 4 to $8\frac{1}{2}$ ft., in narrower corrugations than Industrial. Colors include gray, red and red mottled.

Thickness is $\frac{1}{2}$ in. at the ridge and in the valley and $\frac{3}{8}$ in. on the slope. These corrugations are sixteen in number, $2\frac{5}{8}$ in. wide and $\frac{7}{8}$ in. deep from top surface to bottom surface of the corrugations, weighing approximately $3\frac{3}{4}$ lb. per sq. ft.

Ambler Asbestos Corrugated Roofing and Siding will be furnished on special order cut to any desired length required from the above mentioned standard sizes. Where it is desired to use curved sheets, they may be furnished on special order, curved at the factory. Sheets may be curved lengthwise with the corrugations.



Large Cement Mill Roofed and Sided with Ambler Asbestos Corrugated

W-R Asbestos Corrugated Sheets

Certain industries, such as gas companies, acetic acid works, and chemical manufacturing plants, often burn coal having high percentages of sulphur. During combustion such coal gives off sulphurous fumes and these coming into contact with condensation, steam, etc., unite to form acid which rapidly and completely destroys most types of metallic commercial roofing materials. The manufacturers of Ambler Asbestos Corrugated Roofing and Siding have further fortified this product by saturating the sheets with an acid-proof and moisture-proof compound, thus making it the ideal roofing for use under unusual and severe conditions. This material is especially furnished for this use and only on special request.

Readily and Economically Applied—It can be erected quickly and, once installed, no further atten-

tion should ever be required. No special tools are required for application. Material can be sawed, punched or drilled, and fastened with bolts and clips, nails, aluminum tie wires or screws.

This material may be applied either according to the staggered line effect, or the vertical or straight line effect, which necessitates the cutting of corners.

Ambler Asbestos Lumber

3D Asbestos Lumber—This type is of monolithic construction, uniform in strength, highly fire-resistant and lends itself to cutting and drilling more readily than the laminated type.

3D Asbestos Lumber is available in sizes 36x48, 42x48 and 42x96 in., in all thicknesses.

Standard Asbestos Lumber—This material is manufactured by the laminated process which accumulates the material in minute layers, all fibres are laid out in the same plane. Tremendous pressure is used in the manufacture of this material and the final result is a sheet unusually flexible, of great density, maximum strength and low moisture absorption.

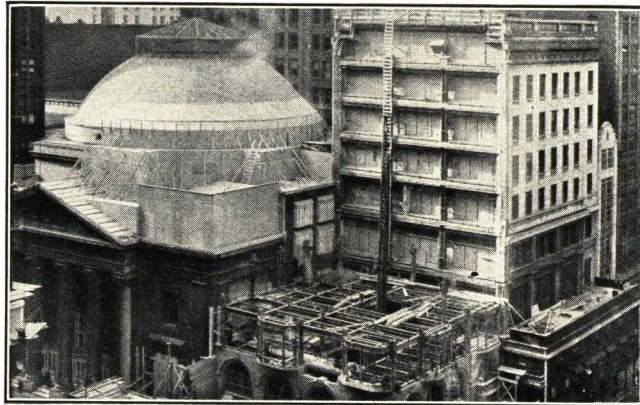
Standard Asbestos Lumber is made in sizes 36x48, 42x48 and 42x96 in. in all thicknesses. 48x96-in. sheets can be furnished in the following thicknesses only— $\frac{3}{8}$, $\frac{1}{4}$, $\frac{3}{4}$ and $\frac{1}{2}$ in.

Ambler Asbestos Lumber is listed by the Underwriters' Laboratories, Inc., and bears a standard "fire" rating.

Our Engineering Department is at your service without obligation.

Ambler Linabestos

Ambler Linabestos Sheets, made $\frac{3}{8}$, $\frac{1}{4}$ and $\frac{3}{4}$ in. thick in sheets 48x48 and 48x96 in., and is recommended for interior or exterior sheathing where a flameproof, fire-resisting board is required.



Installing Linabestos, Girard Trust Company, Philadelphia, Pa.

Ambler Linabestos Sheets are also furnished in press-indented 4x4-in. blocks, straight joints or 3x6-in. brick broken joints. Can be sized and painted or enameled to represent tile.

Ambler Asbestos Waltile

A decorative tiling, ready for immediate application to old walls as well as new. Waltile is made of a fireproof asbestos compound, pressed into rigid sheets 32x48 in., $\frac{1}{8}$ in. thick and given a permanent, decorative, glossy surface.

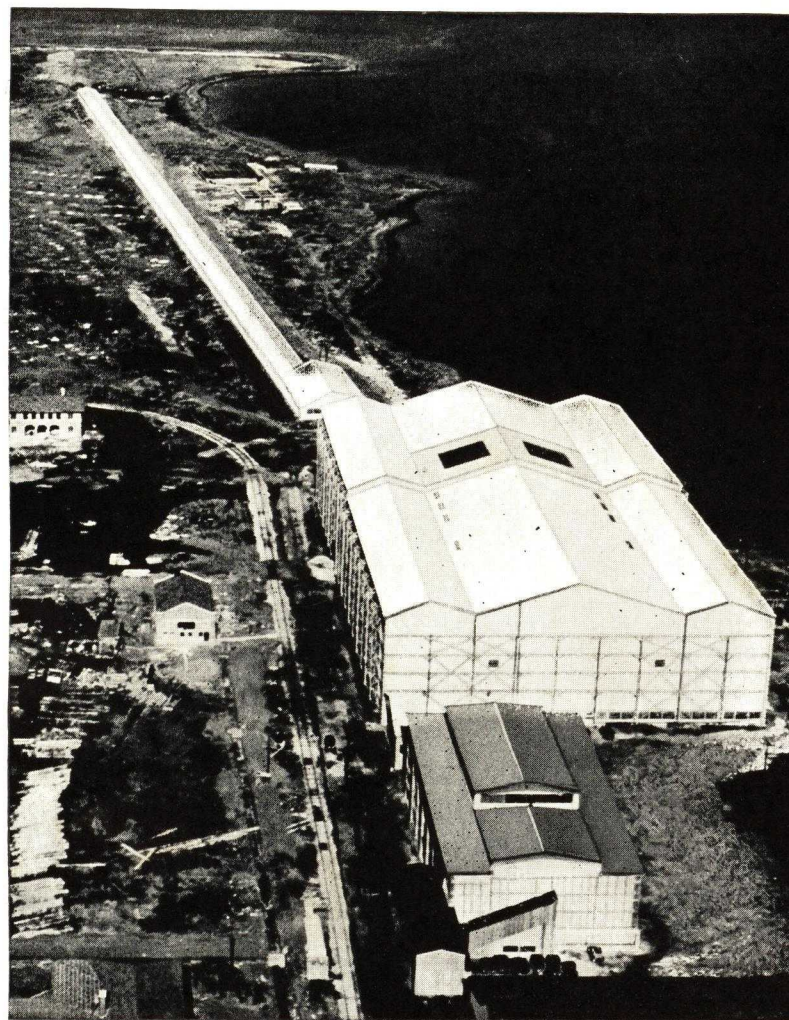
Waltile may be had in the following colors: white, smoke, black, pink, cream, apple green, and Nankin blue. It is scored 4x4 in. for tile effects and is ready for application to old or new walls.

Waltile is fireproof, verminproof and easy to clean. Cap and base mouldings also furnished.



Careystone

CORRUGATED ASBESTOS-CEMENT
ROOFING AND SIDING



THE PHILIP CAREY COMPANY, CINCINNATI, OHIO

INTRODUCTION

In the preparation of this catalogue it has been the aim of THE PHILIP CAREY COMPANY to present fundamental data regarding the manufacture and application of Careystone Corrugated Asbestos—Cement Roofing and Siding in such form as to be of maximum use to the engineer and architect.

Because of its unusual characteristics this product has become increasingly popular during the last few years. However, as is the case with any material, a satisfactory job depends upon careful, well-studied plans and correct installation. It is the hope of the company that the information contained herein will prove of assistance to the engineer in securing completely successful work.

The manufacture of Corrugated Asbestos-Cement Roofing and Siding involves far more than merely mixing asbestos fibre and portland cement and pouring it on a corrugated form. It is a highly developed manufacturing operation requiring a large initial investment for special equipment, which, when properly installed, must be operated by a competent, qualified and trained corps of engineers and technicians. A detailed description of this process is given on the following page.

THE COMPANY

THE PHILIP CAREY COMPANY, founded in 1873, has enjoyed more than sixty years of continued progress and prosperity and is, today, universally recognized as one of the leaders of the industrial world. Having vast resources, both natural and financial, the company is directed and managed by thoroughly trained executives, who control the intricate problems of manufacture from the basic raw materials to the finished product. The required equipment has been especially designed and our procedure of manufacturing control, through our Research Laboratory, insures to our clients and customers the finest and most skillfully designed corrugated asbestos roofing and siding possible to manufacture even in these modern times.

ENGINEERING SERVICE

An efficient staff of engineers is maintained and their services are at the disposal of our customers. Their wide experience covers the recommendation and application of Careystone Corrugated Asbestos Roofing and Siding on thousands of factories, railroad buildings, aeroplane hangars, warehouses, power plants, foundries, chemical plants—in fact, every conceivable type of industrial building. This service includes the preparation of detailed estimates, sheet lay-outs, and many helpful suggestions for the use and application of Careystone Corrugated Asbestos Roofing and Siding, for which there is no charge. Address any of the Branch Offices or Distributors listed on the back cover or the Home Office.



Carey Built-up Roofing
 Carey Roof and Metal Protective
 Paints
 Carey Elastite Asphalt Plank
 Carey Elastite Expansion Joint
 Carey Asphalt Primer
 Carey Manco Asphalt
 Carey Elastite Track Insulations
 Carey Elastite Crossing Pavement
 Carey Alumino-Hi-Temp
 Carey Rock Wool Blankets
 Carey Thermolite Blocks and Sheets
 Carey Insulating Cements
 Carey Refractory Cements
 Carey Insulating Sheets and Panels
 Carey Insulating Powders, Pipe Coverings, Felts and Coatings
 Carey Panel Board
 Carey Asbestos-Cement Shingles
 Carey Asfaltslate Shingles
 Carey Strip Shingles
 Carey 85% Magnesia
 Carey Hi-Temp No. 12
 Carey Underground and Exposed
 Pipe Insulations
 Carey Cold Water Insulations
 Carey Weather-Proofing Products

THE PHILIP CAREY COMPANY
 LOCKLAND, CINCINNATI, OHIO

FRONT COVER

The aerial view on the front cover shows the laboratories of the National Advisory Committee for Aeronautics, Langley Field, Va. The buildings shown are the "N. A. C. A. Tank," the Full Scale Wind Tunnel and the Propeller Research Tunnel. Careystone Roofing and Siding used on all buildings. (More than 95 carloads.)



CORRUGATED ASBESTOS-CEMENT ROOFING AND SIDING

Careystone Corrugated Asbestos-Cement Roofing and Siding is manufactured by a scientific process combining two of the most durable products known to mankind—Asbestos and Portland Cement.

ASBESTOS

Asbestos is one of the most remarkable of minerals. Its valuable properties have been known for thousands of years, as is proved by many authenticated records. Mined extensively by the Romans, its use has been traced through ancient and medieval history to the present era, and today, without Asbestos, there could be no modern industry. It is much older than anything in the vegetable or animal kingdom, and it is so little affected by the deteriorating influences of Time, that though the rocks in which it is contained have crumbled away there has been no appreciable effect on the Asbestos found in them. Its unique properties of fire resistance, low thermal conductivity, and resistance to the attacks of acid and alkalis are unparalleled in Nature.

PORTLAND CEMENT

Portland Cement, as is well known, besides being insoluble and weather and fire resisting, possesses the peculiar property of increasing in toughness and strength upon exposure to the elements. Today, Portland Cement is universally known and used in all types of building construction, where the essential requirements are strength, permanence, fire safety, economy and longevity.

CAREYSTONE CORRUGATED ASBESTOS

By the special Carey manufacturing process, long tough fibers of asbestos are crisscrossed, interwoven, merged together and embedded in a carefully selected grade of portland cement. This rugged mixture is placed on carrier trays, sent through a huge press, and permanently combined under an enormous pressure. Made solely from these two dur-

able and fireproof minerals, Careystone Corrugated Asbestos-Cement Roofing and Siding is a permanent material, possessing natural properties that enable it to resist the action of the elements and the many and varied destructive influences existing in most industrial plants.

Careystone Corrugated Asbestos-Cement Roofing and Siding is non-combustible and offers a resistance to fire which is unsurpassed in other roofing or siding materials. Containing nothing that can rust, rot, or corrode, Careystone has been used extensively for roofing and siding in chemical plants, where acid and alkali fumes are always prevalent. The railroads have been large users of this modern building product, for they have found that its use reduces overhead and maintenance to a minimum. Unlike most metals it is unaffected by salt air and its use is thus becoming more popular by industries located on the seaboard.

Engineering authorities agree that the crystallizing or "setting" action of cement continues for many years and thus Careystone Corrugated Asbestos-Cement Roofing and Siding, unlike nearly every other roofing and siding material, actually grows stronger with age.

Made solely from asbestos fibre and portland cement, Careystone gives permanent service without maintenance, for it *requires no paint or protective coating of any kind*. The first cost is the last cost—maintenance costs are eliminated.

The color of Careystone Corrugated Asbestos-Cement Roofing and Siding is a pleasing cement gray. This light color reflects the rays of the sun and this fact combined with the knowledge that the material has a high asbestos content (one of the best known insulations), indicates that the inside temperature of any building on which it has been used will be materially lower during the hot summer days. Other colors, such as red, green, brown, burnt orange may be specially manufactured if desired.



TECHNICAL AND ESTIMATING DATA

GENERAL SPECIFICATIONS

Careystone Corrugated Asbestos Cement Roofing and Siding sheets are 42 in. wide, being 16 full corrugations of $2\frac{5}{8}$ in. each. Standard lengths are as follows: 3 ft. 0 in., 3 ft. 6 in., 4 ft. 0 in., 4 ft. 6 in., 5 ft. 0 in., 5 ft. 6 in., 6 ft. 0 in., 6 ft. 6 in., 7 ft. 0 in., 7 ft. 6 in., 8 ft. 0 in., 8 ft. 3 in., 8 ft. 6 in., 8 ft. 9 in., 9 ft. 0 in., 9 ft. 3 in., 9 ft. 6 in., 9 ft. 9 in., 10 ft. 0 in.

It is manufactured in three thicknesses: Medium, Standard and Heavy. The Medium has an average thickness of $\frac{1}{4}$ in.; the Standard has an average thickness of $\frac{3}{8}$ in.; and the Heavy has an average thickness of $\frac{1}{2}$ in. The thickness of the material used has no direct bearing on its longevity; the heavier sizes are manufactured to provide increased load-bearing capacity on wider spans.

Maximum Purlin and Girt Spans

	Roofing	Siding
Medium, $\frac{1}{4}$ in. average thickness.....	5 ft. 0 in.	5 ft. 0 in.
Standard, $\frac{3}{8}$ in. average thickness.....	4 ft. 0 in.	5 ft. 6 in.
Heavy, $\frac{1}{2}$ in. average thickness.....	4 ft. 6 in.	6 ft. 0 in.

Weights per Square Foot

	Uncraterd	Craterd
Medium, $\frac{1}{4}$ in. average thickness.....	2.9 lbs.	3.3 lbs.
Standard, $\frac{3}{8}$ in. average thickness.....	3.3 lbs.	3.75 lbs.
Heavy, $\frac{1}{2}$ in. average thickness.....	3.75 lbs.	4.25 lbs.

Less than carload shipments weighing less than 10,000 lbs. will always be crated.

MATERIAL REQUIRED

SHEETS

Sheets to be used for either roofing or siding must be figured to have a side lap of two corrugations ($5\frac{1}{4}$ in.) and an end lap of not less than 6 in. In special cases, as a matter of economy, when the sheets are to be used as siding, the side lap may be reduced to one corrugation ($2\frac{5}{8}$ in.) and an end lap of not less than 4 in. All end laps must occur at all times over a purlin or girt.

When designing trusses and the spacing of purlins or girts, it is desirable to figure on using sheets of stock lengths. Whenever it is necessary to use sheets not of stock lengths, figure the next longest stock length. No charge for cutting.

To determine the number of sheets required per course, taking into consideration the proper allowance for a two corrugation side lap, multiply the length of the course in feet by the unit .3265 rounding out the next full sheet. If the "staggered joint" method of application is to be used, add one additional sheet per course, to take care of cutting.

When one corrugation side lap is to be used, multiply the length of the course in feet by the unit .3048, rounding out to the next full sheet. Between doors and windows on siding, and between skylights on roofing, figure the spaces from the door to door, from window to window, and from skylight to skylight as individual courses, but in such cases, it is not necessary to add the additional sheet if the staggered joint method of application is to be used.

The total square footage in the required sheets may be obtained by multiplying the number of sheets of each length by the length of the sheet, and multiplying that product by the unit 3.5.

For example, 200 sheets, 6 ft. 0 in.=1200

300 sheets, 8 ft. 0 in.=2400

100 sheets, 10 ft. 0 in.=1000

4600 $\times$ 3.5=16,100 sq. ft.

RIDGE ROLL AND CORNER ROLL

Ridge Roll is furnished in double sections, self-adjustable to the pitch of any roof. To estimate the required amount, multiply the length of the ridge in feet by the unit 1.1 (which will allow for the necessary 4 in. lap) and round out to the next multiple of 4. Ridge roll is always furnished in sections 4 ft. 0 in. in length.

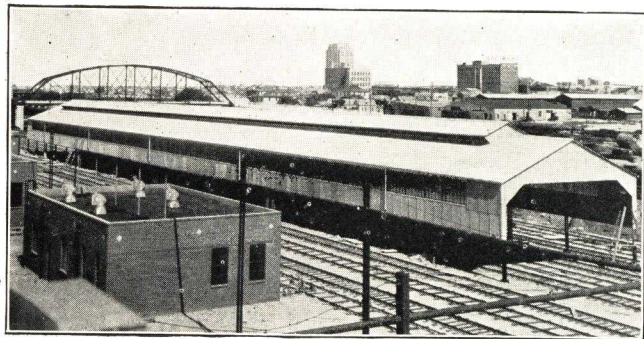
Corner Roll is furnished in 90° angle design with wings of 6 in. and in a standard length of 4 ft. 0 in., for either inside or outside corners. Estimate the quantity required in the same manner as ridge roll, figuring each corner of the building separately.

BOLTS FOR RIDGE ROLL AND CORNER ROLL

For ridge roll and corner roll use 2 in. bolts with nuts, one lead washer and one galvanized washer, figuring $1\frac{1}{4}$ bolt assemblies per lineal foot double section for ridge roll, and the same quantity per lineal foot of corner roll. See ridge roll detail N, corner roll details O and P (page 10).

FASTENERS AND ACCESSORIES

Data on estimating Fasteners and Accessories will be found under the description of the recommended methods of erection on Pages 4 to 9 inclusive.



Careystone Corrugated Asbestos Roofing and Siding Has Been Used by Many Railroads

This illustration shows the train shed at Big Springs, Tex., for the Texas and Pacific Railroad



The Gulf Refining Company Has Used Careystone Corrugated Asbestos Roofing, Careystone Asbestos Sheathing for Siding and Careystone Asbestos Wallboard on Forty Bulk Stations Similar to the Above

RECOMMENDED METHODS FOR APPLYING CAREYSTONE CORRUGATED ASBESTOS-CEMENT ROOFING AND SIDING

All sheets should be applied with a side lap of two full corrugations ($5\frac{1}{4}$ in.), and an end lap of not less than six inches. At the gables, sheets should not overhang the ends of the purlins more than two corrugations. An overhang at the eaves of from six to nine inches is usually allowable. Sheets in the top course should extend within two inches of the ridge.

All sheets should be of the proper length, as all end laps must occur over a purlin or girt. All fasteners must pass through and clip together both the upper and underlying sheets, and must be drawn up tight against the back of the purlins or girts. When bolts are used, care must be exercised to see that the bolt heads are not drawn up too tight against the lead washer so that it will become distorted.

All application must be started true to line, and care must be exercised to keep the horizontal lines formed by the sheets, and the vertical lines of the side laps, straight and plumb.

When applying sheets on the roof, the liberal use of planks and "chicken ladders" is recommended. Do not subject sheets to undue impact, and be careful to walk on the laps, where the sheets are automatically reinforced by the double thickness. Never walk in the center of the span.

Holes for the introduction of bolts, screws, or tie wires, either for roofing or siding, must always be drilled; the drilling to be done in the crest of the corrugation. Never drill holes in the vales of the corrugations. Sheets must always be drilled; never punched. For drilling holes, excellent results are obtained from an ordinary carbon steel twist drill in a hand or small electric drill. These should be sharpened as if for cast iron or steel work. The drill however, should be fed faster, and will rotate more rapidly than in metal work.

No lubricant is necessary. Before drilling measure location of holes exactly to insure proper fit of fasteners.

For sawing and cutting sheets, an ordinary hand saw set five teeth to the inch for cross cutting purposes, may be effectively employed. Excellent results can be obtained from a power hand saw using a carborundum blade.

GROUTING CEMENT AND ROOF PUTTY

Use Carey Grouting Cement for grouting between the aprons of the ridge roll and the vales of the corrugations of the sheets, figuring one pound of Grouting Cement per lineal foot double section of ridge roll.

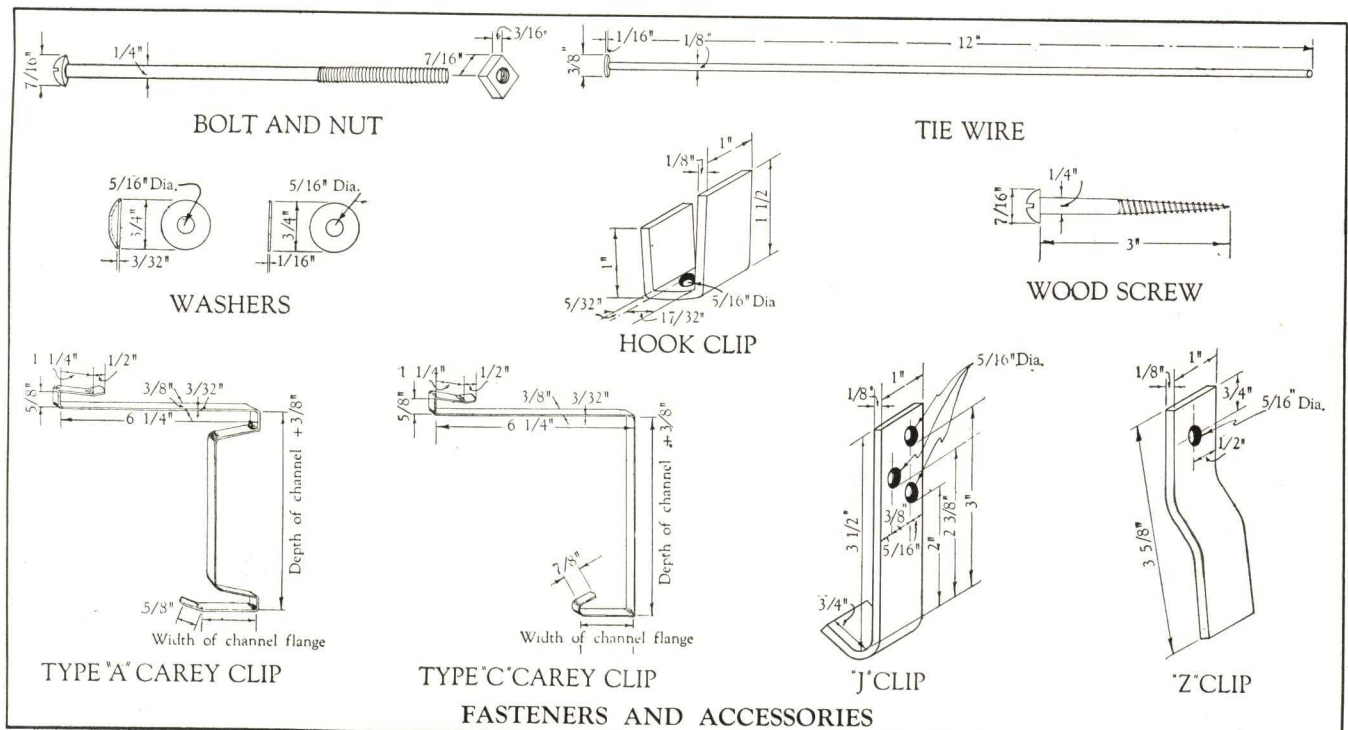
All bolt heads on the roof must be covered with Carey Roof Putty, gray, using ten pounds of roof putty for each five hundred bolts, rounding out to the next unit of ten pounds.

On all roofs having a slope of less than 4 in. in 12 in. all end and side laps must be cemented together with Carey Roof Putty, black, using ten pounds of roof putty per three hundred lineal feet of $\frac{1}{4}$ in. bead, rounding out to the next unit of ten pounds. All roof putty for side and end laps should be applied with a roof cement gun, using $\frac{1}{4}$ in. nozzle.

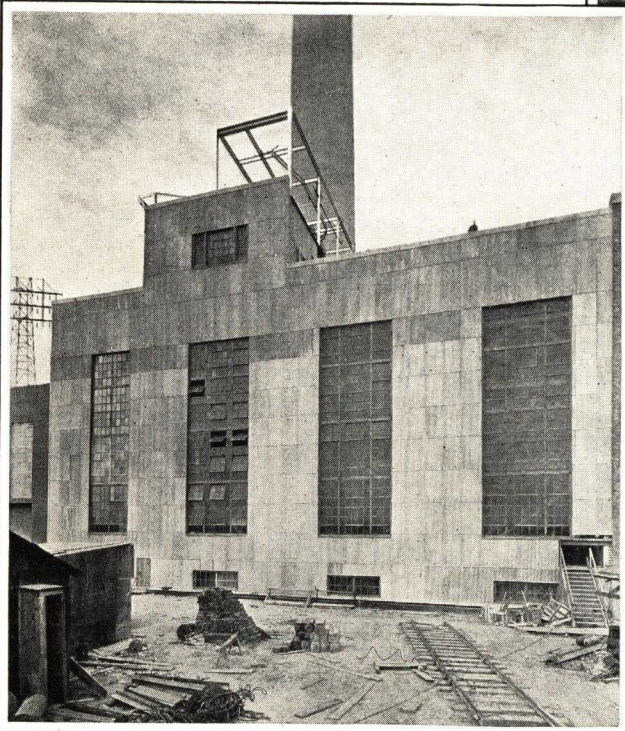
Roof putty should be placed in the vale between the first and second corrugation on the side lap, and three inches below the top of the underlying sheet across the sheet.

NOTE

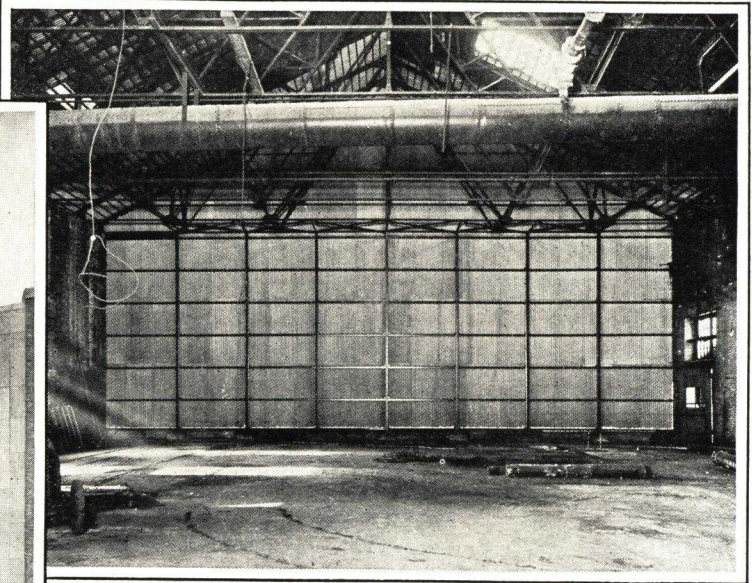
All bolts, nuts, clips and iron washers are furnished hot dipped galvanized. All lead washers are cupped. When excessive corrosive action may be expected from acids or alkalis, we urge that you confer with our Engineering Department so that the proper acid or alkali resisting accessories may be recommended.



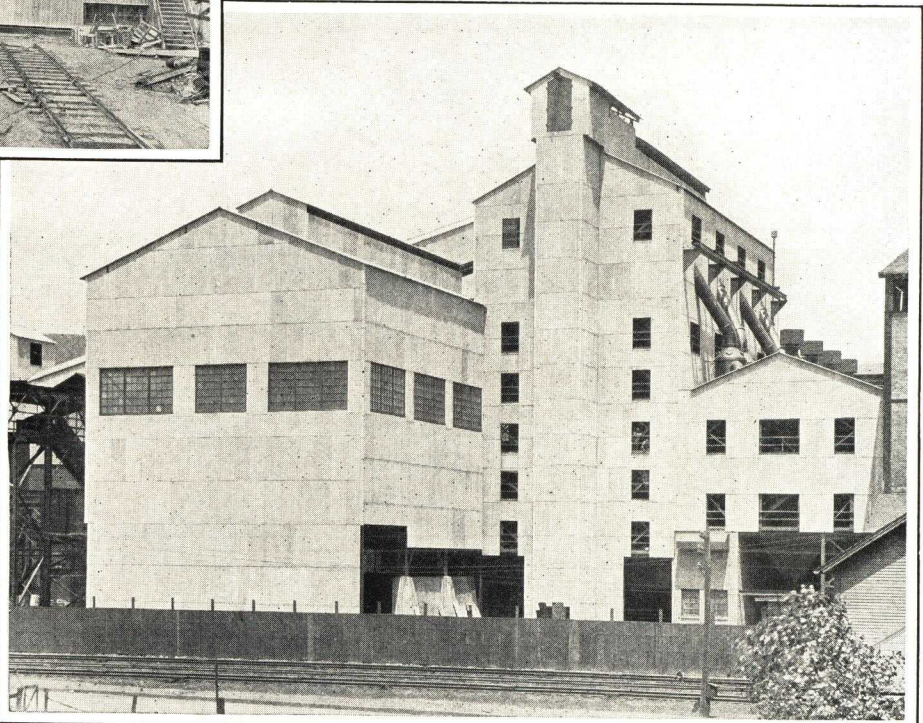
SEVERAL TYPICAL INSTALLATIONS



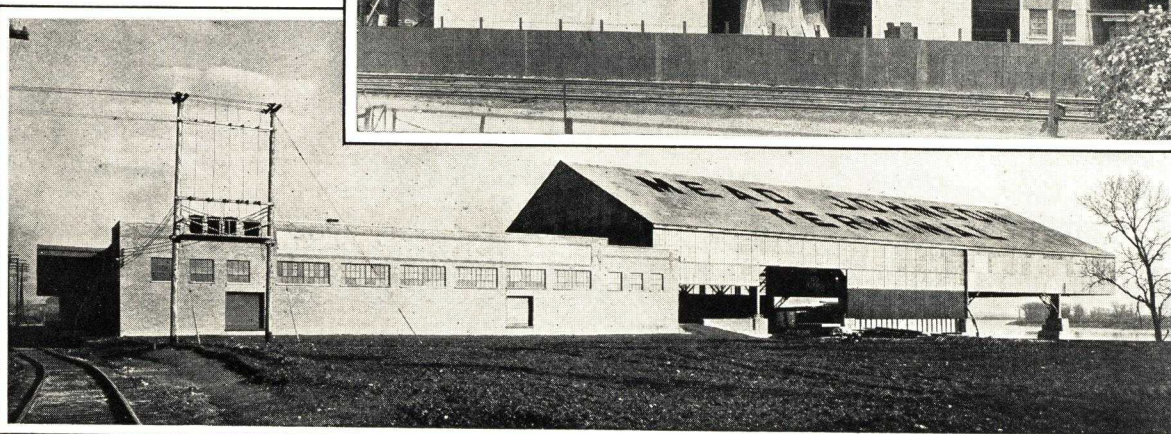
Houston Power & Light Co.
Deepwater Plant,
Houston, Tex.
American Bond and Share Co.,
New York, N. Y.



Worcester Gas Company, Worcester, Mass.
Showing corrugated asbestos partition

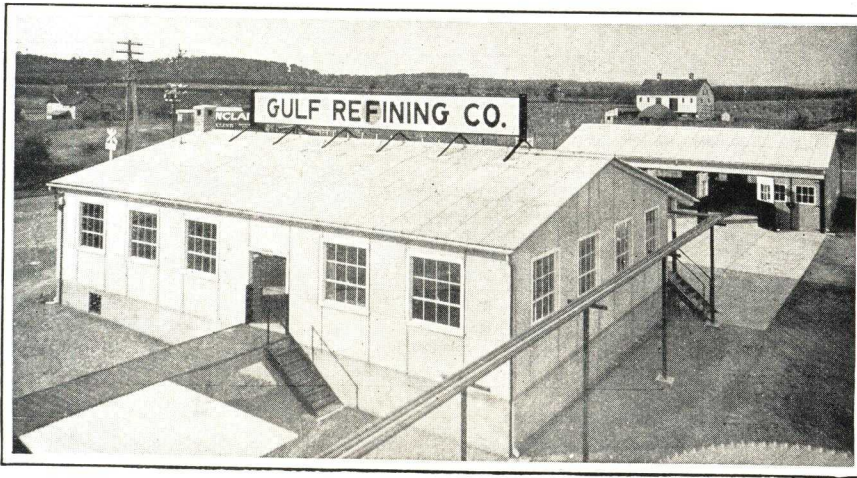


American Steel and Wire Co.
Donora Zinc Works Division,
Donora, Pa.



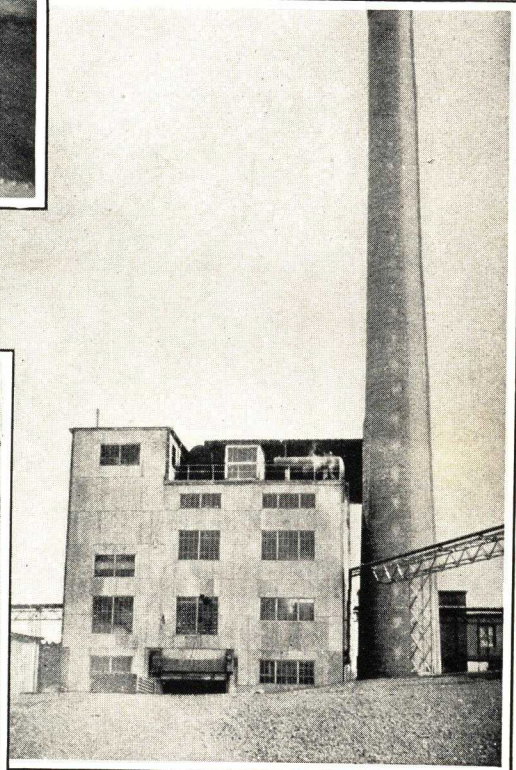
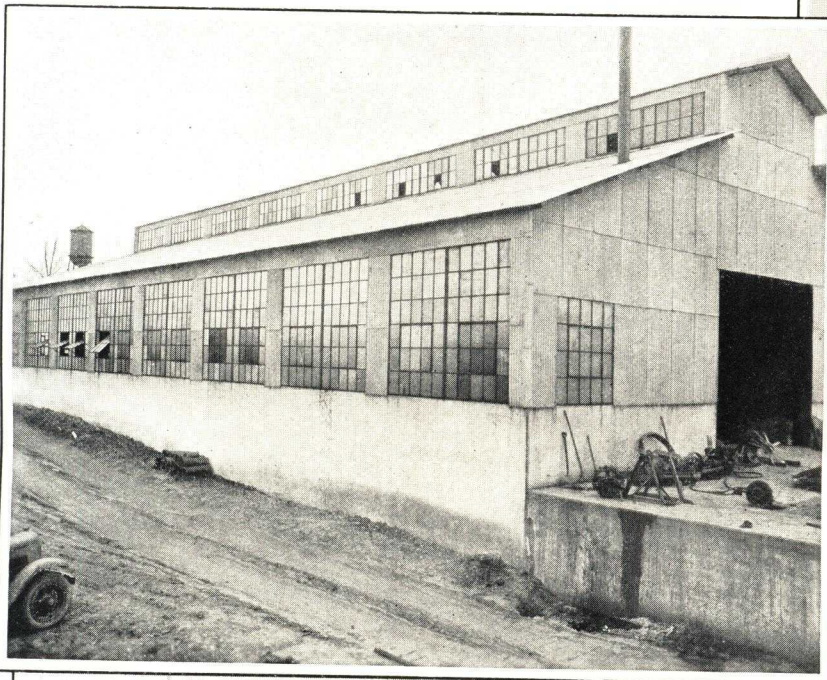
Mead Johnson River Terminal, Evansville, Ind.

OF CAREYSTONE PRODUCTS

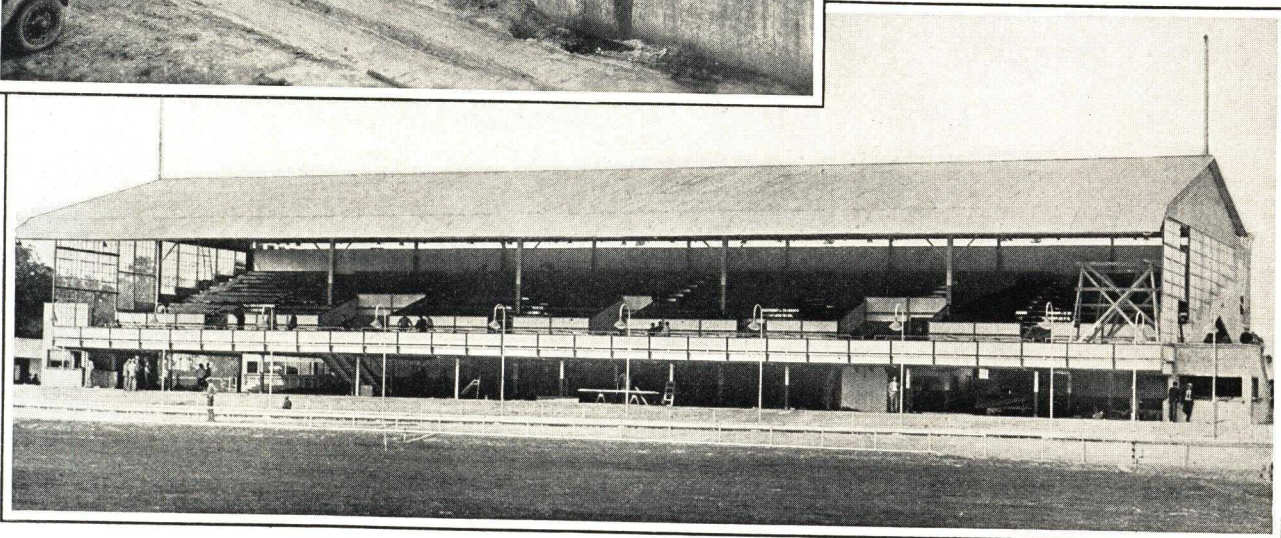


Gulf Refining Company
Bulk Station,
Winchester, Va.

Tennessee Eastman Co., Kingsport, Tenn. →



← Tennessee State Highway Garage,
Jackson, Tenn.



West Florida Racing and Athletic Association Grand Stand, Tampa, Fla.

STAGGERED JOINT METHOD OF APPLICATION

Application must be started true to line. When an overhang is desired stretch a guide line making allowance for a six to nine inch overhang, as may be required.

Begin to apply the sheets at the eaves, starting at the left with a full width sheet, overhanging the purlin by two corrugations at the rake, with the lower end of the sheet against the line stretched for the overhang. The upper end of the sheet must extend at least three inches beyond the top of the purlin.

Fasten and clip the lower end of the sheet to the eave purlin.

The second sheet is applied in perfect alignment with the first sheet overlapping two corrugations of the first sheet with two corrugations of the second. Fasten and clip the lower end of the sheet to the eave purlin, making sure that the first bolt assembly is through the first corrugation of the second sheet, the second bolt assembly through the crest of the sixth corrugation and the third bolt assembly through the crest of the eleventh corrugation.

Apply the third sheet like the second, overlapping two corrugations, and fastening the lower edge of the sheet as described above.

Each successive sheet in the first course should be applied in a like manner to the end of the course. Be sure to allow for a two corrugation overhang at the gable on the right end.

To apply the first sheet on the second course take a full size sheet and cut off two corrugations. Place this sheet so that the outside line of it is in perfect alignment with the first sheet of the first course, and the lower part of it overlaps

the top of the underlying sheet at least six inches. Fasten the lower end of this sheet and the upper end of the first sheet of the first course.

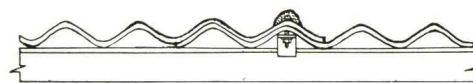
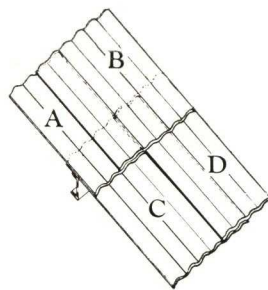
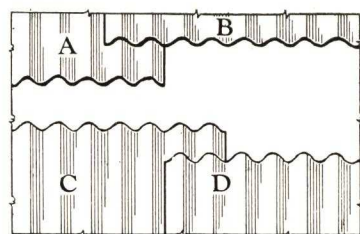
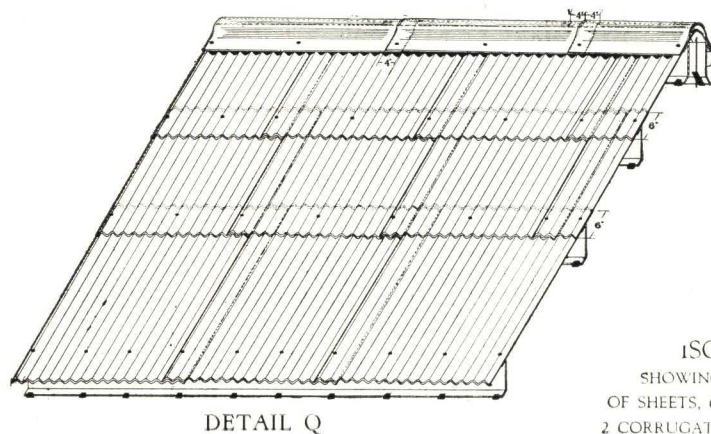
Continue to apply the second course sheets across the roof with full width sheets, overlapping each successive sheet two corrugations over the preceding sheet. Fasten the lower end of this sheet and the upper end of the sheets of the underlying course, using one complete bolt assembly in the crest of the first corrugation and one complete bolt assembly in the crest of the seventh corrugation.

After the end laps have been properly fastened to the purlins or girts, bolt sheets to the intermediate purlins using one bolt assembly in the crest of the first corrugation of each sheet and one bolt assembly in the crest of the seventh corrugation of each sheet.

Snap a chalk line across the roof as a guide to insure proper alignment of all sheets.

To apply the first sheet of the third course, take a full size sheet and cut off four corrugations. Place this sheet so that the outside edge is applied in perfect alignment with the outside edges of the first sheets on the first and second courses, overlapping the upper end of the first sheet of the second course at least six inches.

Continue to apply the third course sheets using full width sheets overlapping each succeeding sheet two corrugations over the preceding sheet. Bolt as described above for the second course sheets. For subsequent courses continue staggering, applying and fastening in a like manner. See detail Q, R, S and T, below.



CUT CORNER METHOD OF APPLICATION

Cut corners butt together and are overlapped by the uncut corner of the next sheet making a watertight joint at the intersection of sheets. See drawing below.

The first course is applied by commencing at the left with a full width sheet (marked A), overhanging the end of the purlin by two corrugations with the lower end of the sheet against the line stretched as a guide to allow for the overhang. The upper end of the first course of sheets must extend at least three inches beyond the top line of the upper purlin.

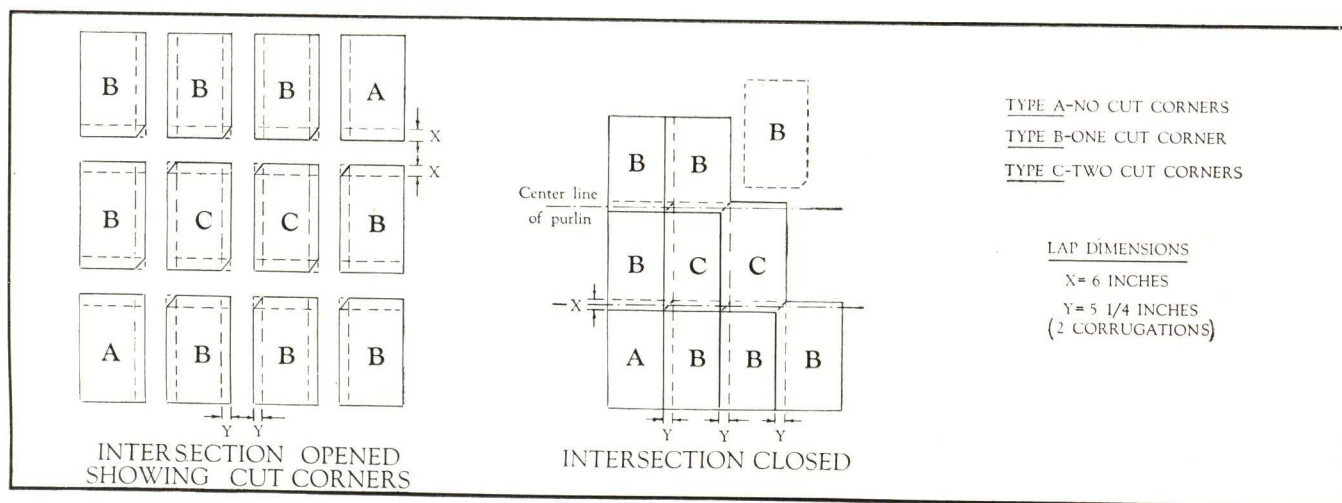
The next sheet (marked B), is applied in perfect alignment with the first sheet (A) overlapping two corrugations of the first sheet with two corrugations of sheet B. It will be noted from detail below that the upper left hand corner of sheet B is clipped off. Apply the third sheet in the same manner as the second sheet and subsequent sheets of the first course in a like manner, all sheets having the upper left hand corner clipped. The lower end of this course of sheets should be fastened to the eave purlin with three bolt assemblies per sheet, the first bolt assembly to be placed in the crest of the first corrugation, the second bolt assembly in the crest of the sixth corrugation, and the third bolt assembly in the crest of the eleventh corrugation.

The first sheet of the second course and successive courses, not including the ridge course, marked "B" is applied with the clipped off portion in the lower right hand corner.

Do not stagger the sheets. Apply them in perfect alignment as shown in detail below. The lower end of this course and successive courses as well as all intermediate purlins should have the sheets fastened to them with two complete bolt assemblies, the first to be placed in the crest of the first corrugation and the second in the crest of the seventh corrugation.

Succeeding sheets of this course, marked "C," are applied in perfect alignment with the first sheet of this course, overlapping each sheet two corrugations over the preceding sheet. The type "C" sheet is used for the remaining sheets in this course, and it will be noted that the Type "C" sheet has both the upper left and the lower right hand corner clipped off. The last sheet on this course, it will be noted is a Type "B" sheet.

The ridge or top course is applied in the same manner as the first course, with the exception that the position of the sheets is exactly reversed, the first and succeeding sheets of the course being Type "B" sheets with the lower right hand corner clipped off and the final finishing sheet a Type "A" sheet, that is with all corners unclipped.



METHODS OF FASTENING

BOLT AND CLIP METHOD FOR ROOFING

When the flanges of the roof purlins are turned "down," use two "J" clips, two galvanized bolts of the proper length with nuts, two lead washers, and two galvanized washers per sheet per purlin—except at the eave and ridge purlin. At the eave and ridge purlin three complete fastener assemblies must be used. The first fastener assembly is to be placed through the crest of the first corrugation on the eave and ridge purlin, the second through the crest of the sixth corrugation, and the third through the crest of the eleventh corrugation, and on subsequent purlins the first bolt assembly is to be placed through the crest of the first corrugation, and the second through the crest of the seventh corrugation. This method is known as the single "J" clip method and is shown in detail A on the next page.

All bolts must be $\frac{1}{4}$ in. in diameter, and at least three inches

longer than the depth of the purlin on which they are to be used. When the flanges of the roof purlins are turned "up," either the double "J" clip method or the "Z" clip method of fastening can be used. The double "J" clip method is shown in detail B and the "Z" clip method in detail C.

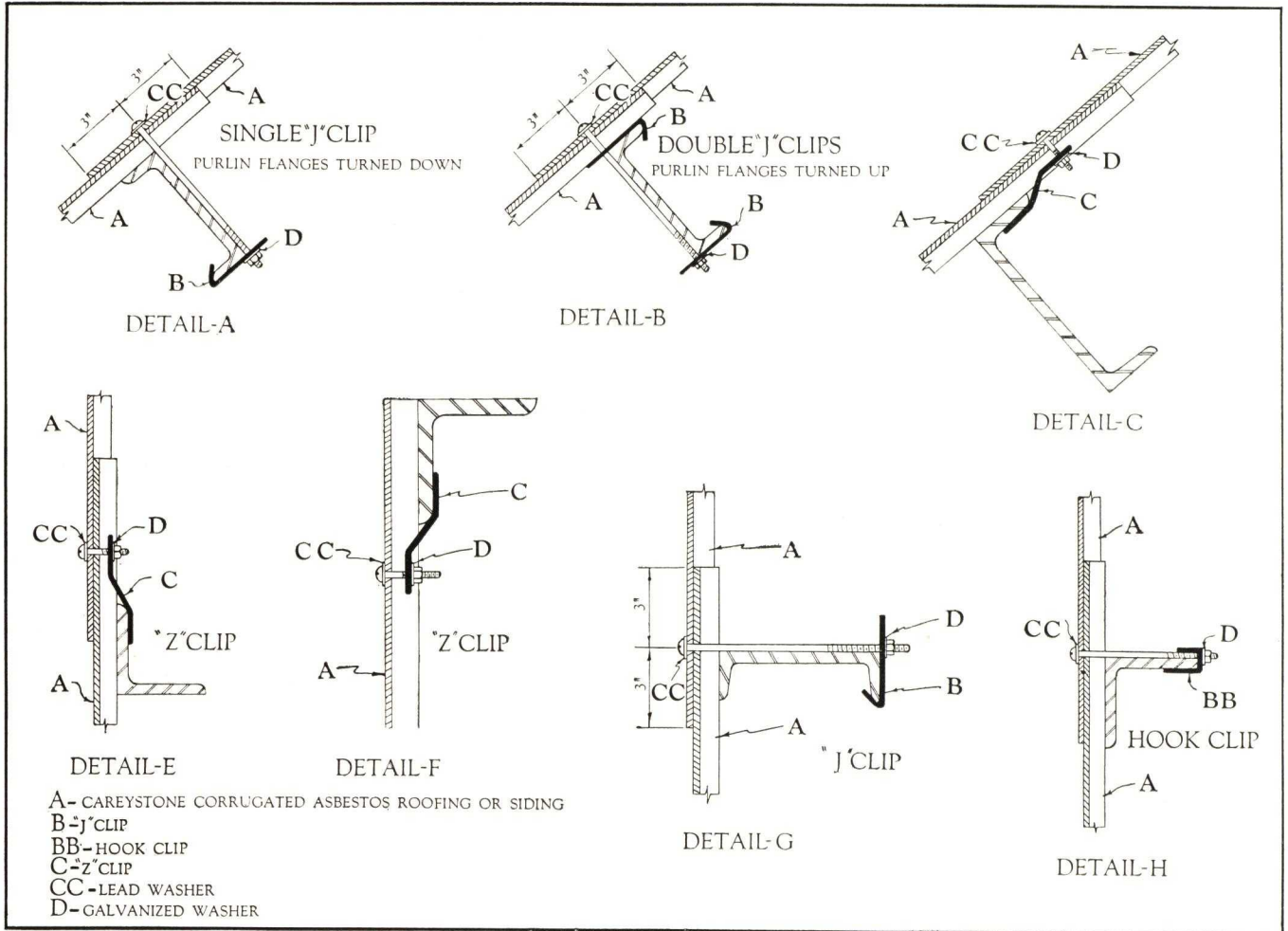
If the double "J" clip method is to be used, use the same number of bolt assemblies as described in the single "J" clip method, but doubling the number of "J" clips. All assemblies to be placed as described above. If the "Z" clip method of fastening is to be used, estimate the number of bolt assemblies required in exactly the same manner as described above for the single "J" clip method, with the exception that "Z" clips are to be used rather than "J" clips, and all bolts must be two inches in length. All assemblies to be placed as described above for the "J" clip method.

BOLT AND CLIP METHOD FOR SIDING

When the girts are channels with the flanges "up," or angles with one leg outside and up, and the other leg pointing in, the "Z" clip method of fastening may be used as described above for roofing and the quantities required are estimated in a like manner. The placing of the bolt assemblies is to be identical. Shown in detail E and detail F. When the girts are channels with the flanges pointing "down," the "J" clip method, as described above for roofing may be used, and the quantities required are estimated in a like manner.

The placing of the bolt assemblies is to be identical. Shown in detail G.

When the girts are angles with one leg "down" and one leg pointing "in" the "hook clip" method of fastening may be used. Figure the quantity of complete bolt assemblies required as described above for the "J" clip method for roofing, except that all bolts must be three inches longer than the leg of the angle that is pointing "in." Shown in detail H. The placing of angle girts with one leg facing out, and the other leg facing down or up should be avoided, as special methods of fastening and siding sheets must, in that event, be devised.

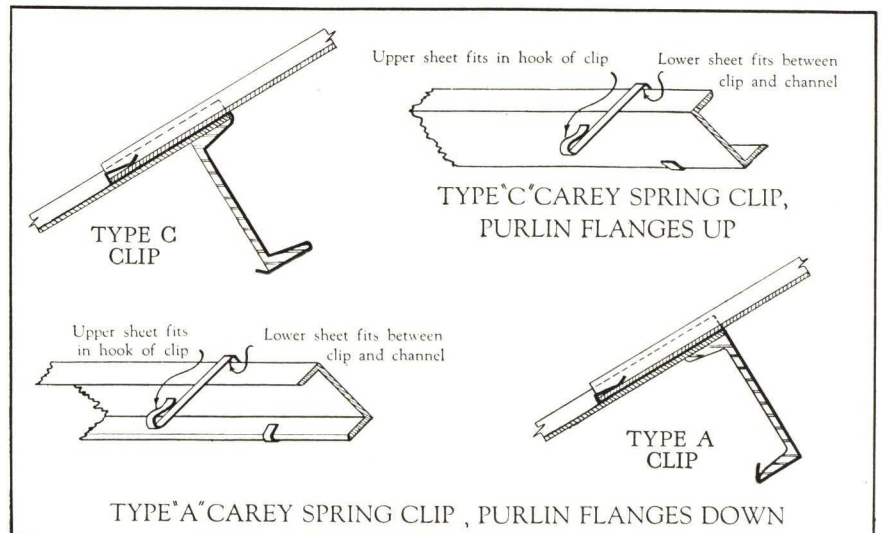


CAREY SPRING CLIP METHOD FOR ROOFING

The use of Carey Spring Clips will materially reduce erection costs, though the cost of materials will be slightly increased because of the required lap of the sheets over each purlin.

This method of fastening can only be used with the staggered joint method of application, and is not to be used for the application of siding. It can only be used for roofing when the purlins are channels though the flanges of the channels may either be faced "up" or "down." Because of the fact that all the sheets must be of a length sufficient to cover one span only, the finished roof will have a much better appearance. At the eaves and ridge purlin either the "J" clip method or the "Z" clip method described above for roofing must be used and the required number of bolt assemblies estimated accordingly. On all other purlins use two Carey Spring Clips per sheet. The first Carey Spring Clip is to be placed in the vale between the first and second corrugations and the second Carey Spring Clip is to be placed in the vale between the seventh and eighth corrugations.

The size of the Carey Spring Clip to be used depends on the depth of the channel purlin and whether the flanges are faced up or down the roof.



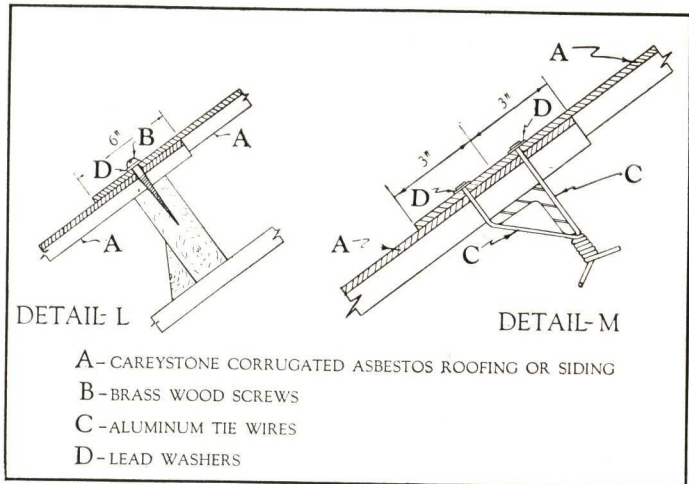
WOOD PURLINS OR GIRTS AND TIE WIRE METHOD

WOOD PURLINS OR GIRTS

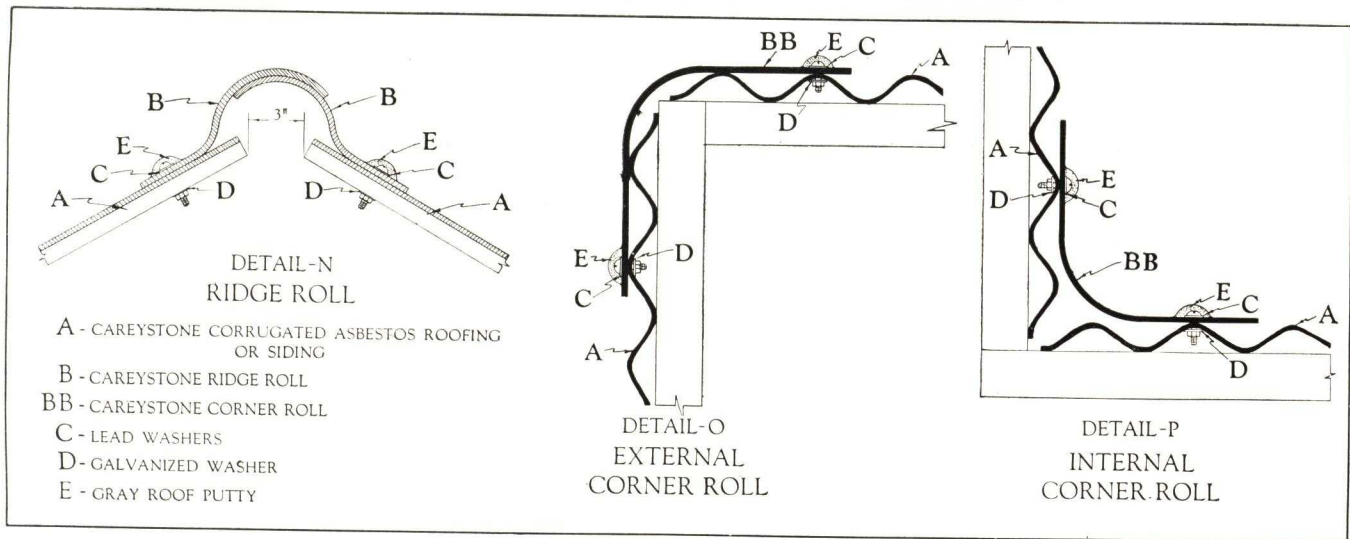
When the building to be roofed and sided has wood purlins or girts, we recommend that Careystone Corrugated Asbestos-Cement Roofing and Siding be applied with 3 in. No. 14 brass wood screws. Under the head of each screw must be placed a lead washer, and in no case are the screws to be driven with a hammer. Use a screw driver. The number of brass screw and lead washer assemblies required is estimated in an identical manner described above for the "J" clip method for roofing. See detail L.

TIE WIRE METHOD

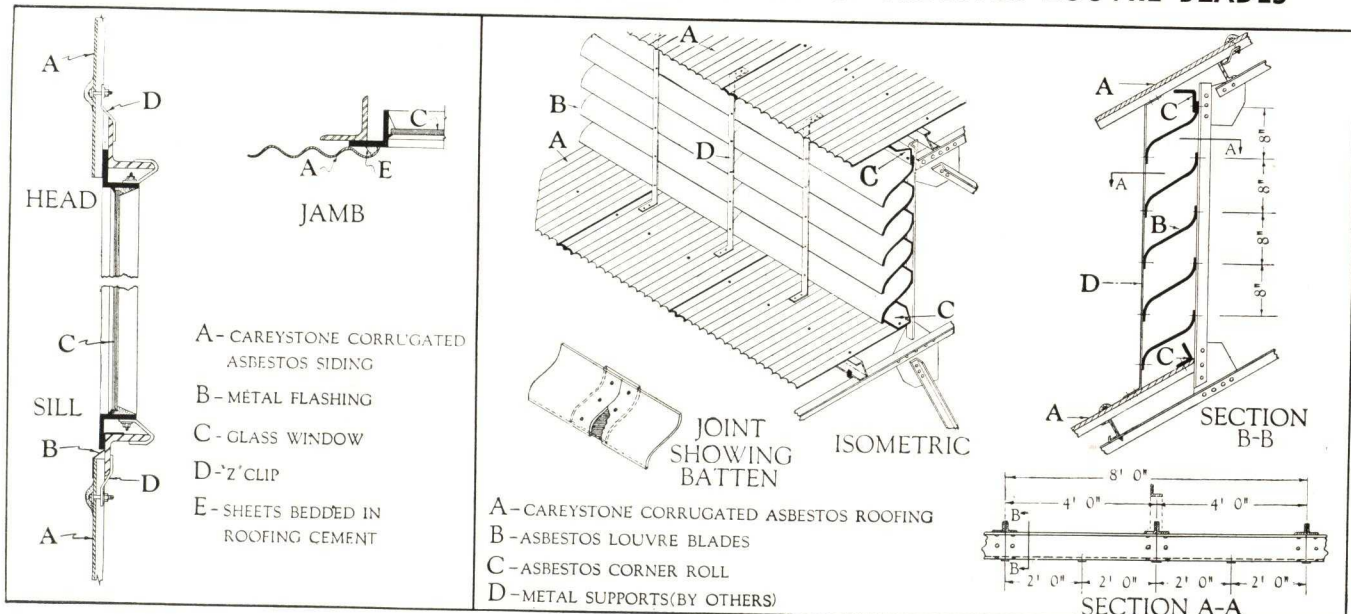
Under ordinary conditions we do not recommend the use of Tie Wires. Where conditions are altered their use is sometimes necessary. In that event we recommend the use of Aluminum Tie Wires. To obtain the number required multiply the number of purlins and girts by the number of sheets plus two, and double that result. Tie wires at least six inches longer than the depth of the purlin should always be used, viz: 6 in. purlins require 12 in. tie wires. Before using tie wires, we suggest that you consult our Engineering Department. See detail M.



APPLICATION OF RIDGE ROLL AND CORNER ROLL



APPLICATION OF SIDING AT STEEL SASH AND OF ASBESTOS LOUVRE BLADES



SUGGESTED SPECIFICATIONS

The roofing and siding shall be Careystone Corrugated Asbestos-Cement Roofing and Siding, the thickness of which shall be in accordance with the manufacturer's recommendations for span limits. All sheets shall be forty-two inches wide, being sixteen corrugations of two and five-eighths inches each.

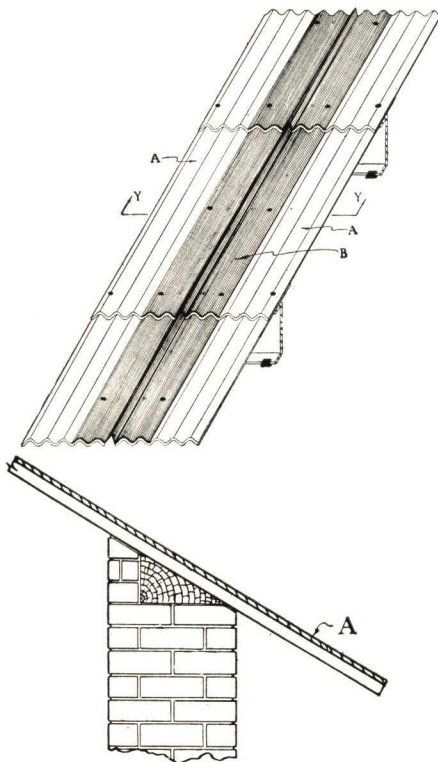
The sheets shall be manufactured solely from asbestos fibre and portland cement, and shall be rigid, true, and free from all defects. The ridge roll and corner roll shall be manufactured in a like manner.

All end laps between sheets shall occur over a purlin or girt, and all sheets shall be fastened to the substructure in strict accordance with the manufacturers' instructions.

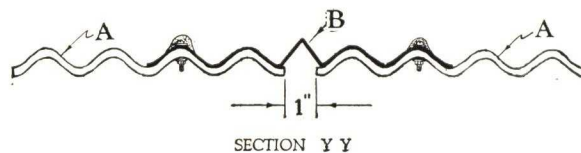
Before making shipment of the roofing and siding sheets, the manufacturer is to furnish the Engineers for approval detailed sheet layout blue prints.

The erection of the roofing and siding sheets shall be done in the best approved manner and shall be subject to approval by the manufacturers prior to acceptance.

EXPANSION JOINT AND FLASHING DETAILS

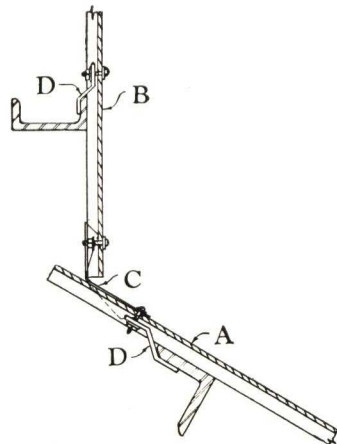


EAVE FLASHING FOR BRICK WALLS

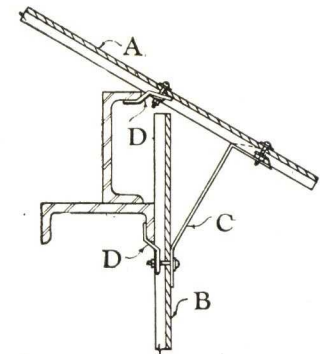


EXPANSION JOINT

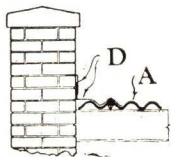
A - CAREYSTONE CORRUGATED ASBESTOS ROOFING AND SIDING
B - 1/2" CRIMP METAL



FLASHING AT BASE OF MONITOR

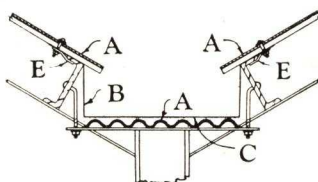


FLASHING AT EAVES



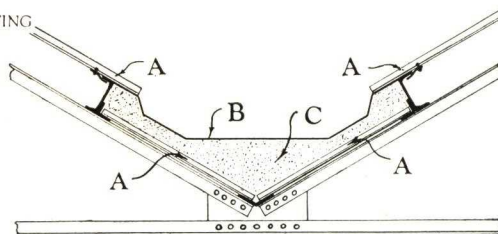
END WALL FLASHING DETAIL

A - CAREYSTONE CORRUGATED ASBESTOS ROOFING
D - METAL FLASHING



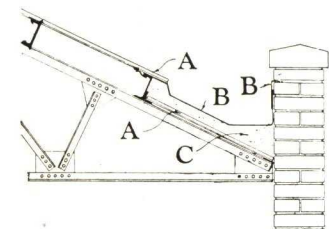
GUTTER FLASHING

A - CAREYSTONE CORRUGATED ASBESTOS ROOFING
B - METAL GUTTER
C - CEMENT GROUT
E - Z CLIP



VALLEY FLASHING

A - CAREYSTONE CORRUGATED ASBESTOS ROOFING
B - CAREY VALLEY MATERIAL OR METAL
C - CEMENT FILL



GUTTER FLASHING

CAREYSTONE ASBESTOS SHEATHING (FLAT)

Careystone Asbestos Sheathing is manufactured of the same durable materials as Careystone Corrugated Asbestos Roofing and Siding, that is, asbestos fibre and portland cement, compressed under great hydraulic pressure. The resulting asbestos board is a flat, hard, dense, fireproof building material.

It is furnished in the following stock size sheets: 42x48 in.; 42x96 in.; 48x48 in.; and 48x96 in. Other sizes may be furnished from these stock sizes. It is manufactured in the following thicknesses: $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ and 2 inches.

Careystone Asbestos Sheathing is fireproof, vermin proof, rustproof and will not corrode. It is weather-resistant and may be used for either exterior or interior sheathing.

It may readily be cut, drilled and sawed, and is in general use for walls and ceilings, paneling, partitions, and has also been used extensively for doors, fume hoods, lockers, radiation shields, smoke ducts, and for a variety of other purposes.

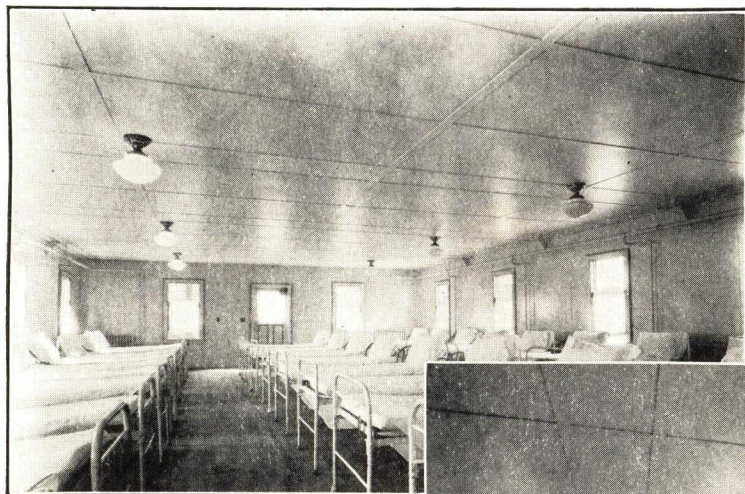
It may be applied directly to steel or wood studs or on wood sheathing, and may be artistically decorated in any fashion. One of the main advantages of Careystone Asbestos Sheathing is that it is vermin and rat proof. Its smooth surface may be readily cleaned and it has the added advantage of being a material that does not absorb odors. For lining the walls of refrigerators it cannot be surpassed. Careystone Asbestos Sheathing has been used extensively in dairy barns

poultry houses and general farm buildings; as it is fire-safe and hygienic. One of the best features of Careystone Asbestos Sheathing is that it may be worked with ordinary tools and does not require any special knowledge for its application.

Installation Data

When Careystone Asbestos Sheathing is to be used as walls or ceilings in new work, we urge that the studs be placed on 16 in. centers so that stock width sheets may be used without cutting. We recommend that the sheets be fastened to the studs with brass wood screws if the application is over wood studs, and with galvanized bolts, if the application is to be made on steel. For interior work copper or ordinary nails may sometimes be used to advantage. Joints between the sheets may be covered with batten strips cut from sheets in widths of from two inches up, although the smooth edges of each sheet permits them to be butted together at the studs, with pleasing effect.

Careystone Asbestos Sheathing is a building lumber having beauty, permanence, and is reasonably priced. For full particulars concerning the application of Careystone Asbestos Sheathing we suggest that you write our Engineering Department and discuss your problem. This service is without charge.



Board of Hospitals City of New York,
Welfare Island, N. Y.



Careystone Corrugated Asbestos Roofing
Careystone Asbestos Sheathing
Careystone Asbestos Wall Board



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For Other Republic Products, see Manufacturers' Index

TONCAN IRON SHEETS

Plain and Corrugated—Black and Galvanized

Formed Roofing and Siding Products

Toncan Iron—What It Is

Toncan Iron is a ferrous alloy of scientifically refined iron, copper and molybdenum in correct proportions—the alloy which, among ferrous metals, ranks first in rust resistance after the stainless alloys.

Toncan Iron unquestionably represents the greatest advance in ferrous metal in more than a generation. This rather broad statement is predicated on thousands of rigid tests made in the laboratory and in actual service over a period of years.

Its Advantages as a Sheet Material

In the course of tests and service it has been proved that Toncan Iron possesses certain advantages which, stated briefly, are:

(1) It resists to a higher degree more of the many and varied types of corrosion than any other ferrous material except the stainless alloys. This resistance is not confined to the surface or "skin" of the metal, but is uniform throughout its entire cross section.

(2) It combines the high rust resistance of an alloy iron with many of the desirable physical properties of less resistant ferrous materials.

(3) It is one of the most workable of materials. It is remarkably soft. It forms easily. Unlike other ferrous materials, cold working—cutting, bending, punching, stamping, drawing, etc.—in no way affects the rust resistance of Toncan Iron.

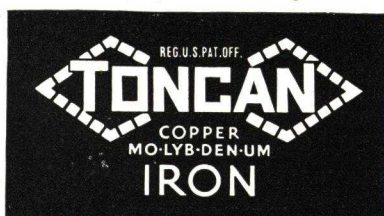
(4) It welds easily by any of the usually accepted modern methods. The use of Toncan Iron welding rod insures an installation of equal rust and corrosion resistance throughout.

(5) A uniform and tightly adherent galvanized coating can be applied, thus adding the protection of a coating of zinc to the already high rust resistance of the base metal itself.

(6) Through its longer trouble-free life, it has been found to cost far less per year of service. Its use is more than an economy. It is insurance against sheet failures and frequent costly replacements.

Toncan Iron Plain Sheets

Toncan Iron Sheets, black and galvanized, are available in gauges No. 8 to 28, widths from 24 to 50 inches, and lengths from 10 to 13 feet, depending upon gauge and width. Toncan Iron Sheets serve a multiplicity of uses—Heating and



Ventilating Systems; Hoods, Ducts, Chutes, etc.; Skylights and Frames; Stacks; Tanks; Stoves and Ranges; Furniture; Railroad Cars; Automobile Bodies; Mine Tipples; Siding for Buildings of all kinds; Manufactured Products of thousands of types; Sheet Metal Work of every nature.

Toncan Iron Corrugated Sheets

These sheets offer light weight, great rigidity and rust resistance. They add strength to the structure on which they are used and allow a considerable saving in sheathing or other supporting materials. They offer maximum protection against corrosion and fire.

Corrugated Sheets are standard: (A) 2½ and 1¼ in. flat sheets; (B) curved on one or both ends to specifications; (C) cross-corrugated for high structures where there is some wind motion or risk of settling; (D) cross-crimped for cornice and similar work.

2½-inch Corrugated Sheets—Corrugations are 2¾ in., center to center, and ½ in. deep. All gauges No. 10 and lighter. Widths: siding, 26 in.; roofing, 27½ in. Lengths: 5, 6, 7, 8, 9, 10, 11 and 12 ft.

1¼-inch Corrugated Sheets—Corrugations are 1½ in., center to center, and ¾ in. deep. Gauges No. 20 and lighter. Width, 26 in. Lengths: 5, 6, 7, 8, 9, 10, 11 and 12 ft.

Toncan Iron Roofing and Siding

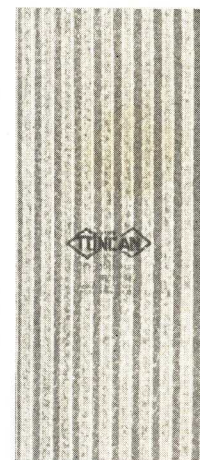
Toncan Iron Roofing is made in 2-V, 3-V, and 5-V Crimped, Standing Seam and Roll Type Roofing. Ridge Rolls, plain and corrugated, are also available. Toncan Iron Siding is made in a variety of styles and sizes.

Identification

Every Toncan Iron galvanized sheet is stenciled with the Toncan Iron trade mark in green. Smaller formed products are die stamped with the trade mark and manufacturer's name. The gauge is also clearly shown.

Literature

"The Path to Permanence," a 64-page book, containing full information on Toncan Iron Sheets, should be in the hands of every user of sheet metal. Write for a copy.



H. H. ROBERTSON COMPANY

Robertson Protected Metal (RPM); Robertson Protected Metal V-Beam Roofs; Hard Finish Robertson Protected Metal

PITTSBURGH, PA.

FACTORIES: AMBRIDGE, PA.; SARNIA, ONT., CANADA; ELLESMERE PORT, CHESHIRE, ENG.

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Products

ROBERTSON PROTECTED METAL (RPM) ROOFING, SIDING, FLASHINGS, GENERAL BUILDING TRIM, DUCTS, etc.; also available in Skylights, Ventilators, Louvres, Hoods and Ducts.

ROBERTSON PROTECTED METAL V-BEAM ROOFS for decks under insulated or built-up roofs; for extra-load-carrying roofs without insulation; or for siding.

HARD FINISH ROBERTSON PROTECTED METAL—RPM in light, attractive colors and "textured" finishes.



For Robertson Ventilators, Skylights, Sidewall Sash, see Manufacturers' Index.

Patents

Robertson Protected Metal, Robertson V-Beam Sheets and Hard Finish RPM are protected by United States Patent No. 1,277,755, September 3, 1918, and by other patents allowed and pending in the United States, Canada, England, France, Belgium, Australia, Japan and New Zealand.

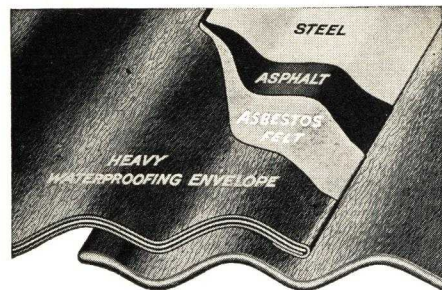
ROBERTSON PROTECTED METAL (RPM)

Robertson Protected Metal is a steel roofing and siding protected against rust, weather and corrosion by a series of external, factory-applied coatings. These coatings are shown on the cutaway drawing below. Hard Finish RPM (described on next page) is the same except for the outer coating, which is supplied in light, attractive colors.

Types of Destructive Agencies It Withstands—RPM has successfully withstood the destructive agencies listed below, on all types of buildings and in all climates. Ask for installation lists.

Sulphuric acid	Caustic soda	Various alkalis
Hydrochloric acid	Nitric acid	Moisture
Hydrofluoric acid	Benzoic acid	Smoke
Hypochlorous fumes	Acetic acid	Condensation
Phosphoric acid	Ammonia fumes	

Complete figures showing results of comparative tests on RPM and other materials under actual conditions and the savings in costs over a period of years may be obtained on request.



Robertson Protected Metal

Cutaway view showing protective layers which cover the steel and prevent corrosion: (1) asphalt; (2) asphalt-impregnated asbestos felt; (3) heavy waterproofing envelope. Lower sheet illustrates manner in which edges are protected

Reduction of Heat Loss—RPM provides greater insulation than unprotected metal sheets, because of the natural insulation of the protective coatings on each side, and also because the slightly "tacky" nature of the external envelope of RPM causes the overlapping sheets to seal

themselves together into one continuous sheet and thus prevents infiltration of cold air.

General Advantages—RPM permanently eliminates the need for painting and other maintenance. It is easily erected. It is

DIMENSIONS, GAUGES, WEIGHTS, COVERAGE OF ROBERTSON PROTECTED METAL

Lengths, 5 to 12 ft., inclusive. Also in odd lengths as specified

	Number of corr. or beads	Width and depth of corr., in.	Gross width of sheet, in.	Net covering width, in.	Side lap	Ga.	†Weight per 100 sq. ft. material area, lbs.			
							Black		Maroon	
							Net	Crated	Net	Crated
Corrugated roofing	12½	2½x3½	33	29¾	1½ corr.	24	175	190	185	200
Corrugated siding	13	2½x3½	33	31	1 corr.	20	200	215	210	225
Mansard	6*	2½x1	33	30	1 bead	18	285	300	295	310
V-beam	5**	1¾	29	26¾	½ v.	24	200	225	215	240
						22	230	255	245	270
						20	265	290	280	305
						18	330	360	345	375

*6 in. c. to c. **5.3 in. c. to c. ***Depth. †For Hard Finish RPM, add 60 to 70 lbs.

RPM is furnished in two standard colors: black and maroon. It can also be supplied with aluminum finish (bright or dull) on one or both sides. Hard Finish RPM is available in buff, green or red.

RECOMMENDED PURLIN AND GIRT SPACINGS FOR RPM

Ga.	Corrugated Roofing		Siding, ft. in.	V-Beam, ft. in.
	Slopes over 4 in. in 12 in. ft. in.	Slopes under 4 in. in 12 in.* ft. in.		
24	4 9	4 9	4 10	7 0
22	5 9	4 9	5 10	8 0
20	6 6	5 9	6 8	8 9
18	7 6	6 6	7 8	10 0

*Where roof slope is less than 4 in. in 12 in., all side and end laps should be laid in Robertson Cement. Corrugated sheets should not be laid where slope is less than 2 in. in 12 in. Mansard sheets should not be laid on slopes of less than 4 in. in 12 in.

light in weight and the supporting structural steel framework can be correspondingly lighter. It is adaptable to wide purlin spacings without danger of sagging.

Vibration will not cause it to break or loosen where it is bolted to the framework nor cause it to leak where the sheets are joined. It can be bent or lapped to fit around corners or gables, to fit curved walls or roofs, to fit warped or uneven surfaces.

20% Wider Than Commercial Corrugated Sheets—This reduces the number of side laps, thus reducing the percentage of loss in covering capacity.

Flashings and Fasteners—Standard flashings and building trim are furnished in RPM in the same colors as the

roofing and siding sheets and in corresponding gauges. Maximum length, 10 ft.

The standard method of fastening RPM is with metal straps around the purlins or girts, bolted to the RPM sheets. These straps are completely encased in corrosion-proof coverings. The straps are 18-gauge steel, $\frac{3}{4}$ in. wide. Bolts are sherardized $\frac{1}{4}$ in. with mushroom shaped heads. For fastening siding sheets where legs of girts face up, there is a sherardized clip and bolt fastening. For applying RPM on wood, special nails with mushroom heads are used. Rivet clips are standard for V-Beam sheets and also available for corrugated or mansard roofing.

Pre-fabricated—All special pieces are cut to fit the plans at our factory and are numbered for ease in erection.

ROBERTSON PROTECTED METAL V-BEAM ROOFS

The Robertson V-Beam Sheet is a protected steel sheet corrugated into deep, angular V-shapes which give it much greater strength than the standard forms of rounded corrugations. It is protected from corrosion in the same manner as the RPM described on the preceding page.

Uses—It is used (a) as a steel deck under insulation and built-up roofing; (b) as a self-contained roof without insulation where extra strength is required, or where the pleasing architectural effect of its deep beams is desired; (c) as siding; and (d) as a permanent form for concrete slab work.

It is used on all types of industrial buildings and factories; on commercial garages, powerhouses, airplane and dirigible hangars, and wherever a roof deck is exposed to corrosive conditions.

Advantages—Robertson V-Beam Sheets have the general advantages of a steel roof deck (that is, (1) its lightness as compared with older forms of deck construction; (2) the fact that it will not absorb moisture, nor warp or swell, and (3) the absence of any movement in the deck which could cause splitting or stretching of the built-up coatings).

In addition, Robertson V-Beam Sheets have three distinct advantages of their own: (a) they make a roof deck which is proof against rust and corrosion even in the presence of chemi-

cals, smoke, steam, etc.; (b) they require no painting or other maintenance; and (c) their strength is so much greater than other types that the number of purlins and the weight of supporting steel work can frequently be reduced.

Contraction and Expansion—The core sheet of the V-Beam Steel Deck is of steel and has the same coefficient of expansion as the structural steel of the building. The external coatings are semiplastic and adhere firmly to the sheets during expansion and contraction. The corrugations of the sheets enable them to take up any movement in the building without disturbing the insulation or built-up roofing.

Dimensions, Gauges, Weights, Coverage, Purlin Spacings, etc.—All figures and dimensions for V-Beam Sheets are given in special sections of the two RPM tables on the preceding page. Dead loads: V-Beam, uninsulated, 3 to 5 lbs. per sq. ft.; insulated, 7 to 10 lbs. per sq. ft. depending on gauge used.

LOAD-CARRYING CAPACITIES OF ROBERTSON V-BEAM SHEETS

Table 1—For use where simple beam conditions exist					Table 2—For use where semi-continuous beam conditions exist					
USS gauge		24	22	20	18		24	22	20	18
Thickness of core sheet		0.025"	0.03125"	0.0375"	0.050"		0.025"	0.03125"	0.0375"	0.050"
Span lengths, ft. in.	D*	Safe loads—lbs. per sq. ft. uniformly distributed				D*	Safe loads—lbs. per sq. ft. uniformly distributed			
4 0	.14	88	110	130	175	.18	110	138	165	220
4 6	.18	70	87	104	140	.23	86	109	130	175
5 0	.22	56	71	85	110	.28	70	88	105	140
5 6	.26	47	59	70	93	.33	59	72	86	115
6 0	.31	39	49	59	78	.39	48	63	72	98
6 6	.36	33	41	50	67	.45	41	52	63	83
7 0	.42	28	36	44	57	.53	34	44	54	71
7 6	.48	25	31	38	50	.60	31	38	47	63
8 0	.55	21	28	33	44	.69	26	34	41	54
8 6	.62	18	24	30	39	.78	23	30	36	48
9 0	.70	16	21	26	35	.88	20	26	32	42
9 6	.78	14	18	23	31	.98	18	23	28	38
10 0	.86	12	16	20	29	1.08	16	21	26	34
10 6	.95	11	15	19	25	1.19	15	20	25	31

*D—Deflection in inches at center of span under tabular loads shown to the right.

Erection—Erection is by roofer or sheet metal man, or by special erection engineers of H. H. ROBERTSON COMPANY. Erection of deck and application of insulation and roofing can frequently be done by the same workmen.

Applying Insulation and Built-up Roofing—The usual procedure is followed. Rigid board insulations are recommended. If one layer is used, it is bolted directly to the V-Beam sheets. If additional sheets are used, the multiple layers are stapled together or are monolithic and are mopped with asphalt and bolted to the deck as a unit. The upper layer of insulation is mopped with asphalt to receive the first layer of built-up roofing. Successive layers are applied in the usual manner.

HARD FINISH ROBERTSON PROTECTED METAL (Bright Colors)

Robertson Protected Metal in the "Hard Finish" possesses the same qualities of corrosion-resistance, light-weight and strength that characterize the standard RPM. It offers the architect and engineer the advantage of using corrugated roofing and siding in bright, "textured" finishes, with all the permanency afforded by the Robertson method of metal protection.

Colors—Standard colors are as follows: buff for interiors, and green, red or buff for exteriors.

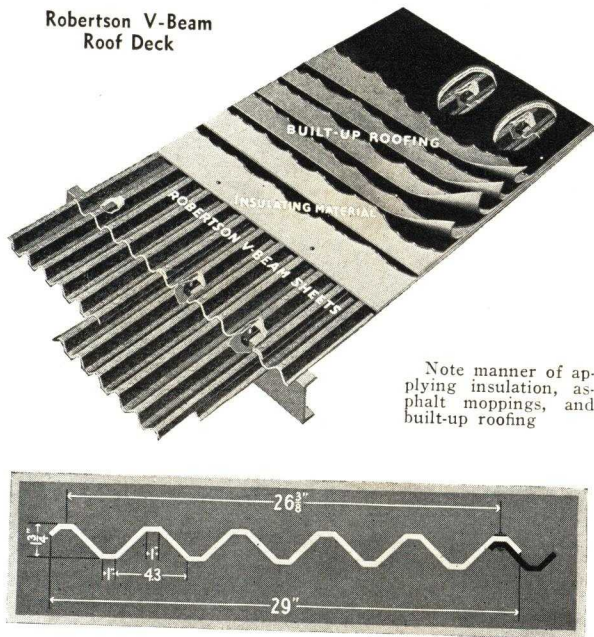
The buff color has been selected as an interior finish on roofing and siding sheets because of its qualities of light reflection without glare.

Thus, the three standard shades offer the possibility of the

use of buff on the inside for interior brightening, a second color for the outside of roofing, and a third for the outside of siding. This latitude is further increased by the possibility of using standard RPM sheeting in maroon or black for roofing and the Hard Finish material in any one of the three available colors for the exterior side wall finish.

Forms—Available in flat sheets, sheets with standard corrugations and also in "extra strength" Robertson V-Beam corrugations, as well as in special shapes for special purposes.

Weights—The weight of Hard Finish RPM is approximately sixty to seventy pounds more per hundred square feet than the figures shown in the table on the preceding page.



AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

Triangle Mesh and Electrically Welded Concrete Reinforcement

208 South LaSalle Street, CHICAGO, ILL.

For other Sales Offices, see our other Catalogues

Products

Manufacturers of TRIANGLE MESH and AMERICAN ELECTRICALLY WELDED WIRE FABRICS for Concrete Reinforcement.

For our pages on Electrical Wires and Cables, and Wire Rope, see Manufacturers' Index.

Uses

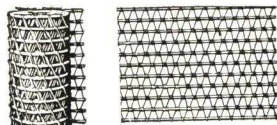
Triangle Mesh and Electrically Welded Fabrics are used for all types of reinforced concrete work including floors, walls, pipe, pavements and reservoirs.

Galvanizing

Furnished plain or galvanized as specified.

Triangle Mesh Reinforcement

A woven wire reinforcement having diagonal cross or secondary members.



Triangle Mesh in Rolls and Sheets

TRIANGLE MESH REINFORCEMENT

Style No.	Number and gauge of wires each longitudinal, A. S. & W. Co.'s steel wire gauge	Section, area longitudinal, sq. in. per ft. width	Total effective longitudinal section area, sq. in. per ft. width	Approx. wt., lb. per 100 sq. ft.
Longitudinals Spaced 4 In. Cross Wires No. 14 Gauge, Spaced 4 In.				
032	1—No. 12 gauge	.026	.032	22
040	1—No. 11 gauge	.034	.040	25
049	1—No. 10 gauge	.043	.049	28
058	1—No. 9 gauge	.052	.058	32
068	1—No. 8 gauge	.062	.068	35
080	1—No. 7 gauge	.074	.080	40
093	1—No. 6 gauge	.087	.093	45
107	1—No. 5 gauge	.101	.107	50
126	1—No. 4 gauge	.120	.126	57
146	1—No. 3 gauge	.140	.146	65
153	1— $\frac{1}{4}$ in.	.147	.153	68
168	1—No. 2 gauge	.162	.168	74
180	2—No. 6 gauge	.174	.180	78
208	2—No. 5 gauge	.202	.208	89
245	2—No. 4 gauge	.239	.245	103
267	3—No. 6 gauge	.261	.267	111
287	3—No. 5 $\frac{1}{2}$ gauge	.281	.287	119
309	3—No. 5 gauge	.303	.309	128
336	3—No. 4 $\frac{1}{2}$ gauge	.330	.336	138
365	3—No. 4 gauge	.359	.365	149
395	3—No. 3 $\frac{1}{2}$ gauge	.389	.395	160

Longitudinals Spaced 4 In. Cross Wires No. 14 Gauge, Spaced 8 In.				
036P	1—No. 12 gauge		.036	17
044P	1—No. 11 gauge		.044	20
053P	1—No. 10 gauge		.053	24
062P	1—No. 9 gauge		.062	27
072P	1—No. 8 gauge		.072	31
084P	1—No. 7 gauge		.084	35
097P	1—No. 6 gauge		.097	40

Longitudinals Spaced 4 In. Cross Wires No. 12 $\frac{1}{2}$ Gauge, Spaced 8 In.				
041R	1—No. 12 gauge		.041	21
049R	1—No. 11 gauge		.049	24
058R	1—No. 10 gauge		.058	28
067R	1—No. 9 gauge		.067	31
077R	1—No. 8 gauge		.077	35
089R	1—No. 7 gauge		.089	40
102R	1—No. 6 gauge		.102	44

Length of rolls: 150, 200 and 300 ft.

Widths: Approximately 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, and 56 in.

Note: Material may be furnished either plain or galvanized.

Free Data

The following literature sent free on request:

"Wire Fabric Concrete Reinforcement as used in Buildings," contains designing and other useful tables, recommended practice and illustrations.

"Reinforced Roads and Streets" contains reasons for its use, suggestions, recommended specifications, illustrations and useful data tables.

"Triangle Mesh Stucco Reinforcement."

"Perfected Plaster Stucco Reinforcement."

Specification Reference

A. S. T. M. Standard Specifications for cold drawn steel wire for concrete reinforcement: A82—27.



American Welded Fabric in Rolls and Sheets

American Welded Fabric

A rectangular mesh, having secondary wires electrically welded to the main or longitudinal wires at the intersections.

*AMERICAN ELECTRICALLY WELDED FABRIC

Spacings of wires, in.		Gauge number		Section areas, sq. in. per ft.		Weight per 100 sq. ft., lb.
Longit.	Trans.	Longit.	Trans.	Longit.	Trans.	
2	16	1	7	.377	.018	140
2	16	2	8	.325	.015	119
2	16	3	8	.280	.015	104
2	16	4	9	.239	.013	89
2	16	5	10	.202	.011	75
2	16	6	10	.174	.011	65
2	16	7	11	.148	.009	55
3	16	1	7	.252	.018	96
3	16	2	8	.216	.015	83
3	16	3	8	.187	.015	72
3	16	4	9	.159	.013	61
3	16	5	10	.135	.011	52
3	16	6	10	.116	.011	45
3	16	7	11	.098	.009	38
3	16	8	12	.082	.007	32
4	16	3	8	.140	.015	56
4	16	4	9	.120	.013	48
4	16	5	10	.101	.011	40
4	16	6	10	.087	.011	35
4	16	7	11	.074	.009	30
4	12	8	12	.062	.009	26
4	12	9	12	.052	.009	22
4	12	10	12	.043	.009	19
4	12	12	12	.026	.009	13
4	12	5	5	.101	.034	48
4	12	6	6	.087	.029	42
4	12	7	7	.074	.025	35
4	12	8	8	.062	.021	30
6	12	0	6	.148	.029	65
6	12	2	2	.108	.054	59
6	12	3	3	.093	.047	51
6	12	4	4	.080	.040	44
6	12	5	5	.067	.034	37
6	12	6	6	.058	.029	32
6	12	7	7	.049	.025	27
6	8	12	12	.017	.013	11
6	6	0	0	.148	.148	107
6	6	1	1	.126	.126	91
6	6	2	2	.108	.108	78
6	6	3	3	.093	.093	68
6	6	4	4	.080	.080	58
6	6	5	5	.067	.067	49
6	6	6	6	.058	.058	42
6	6	7	7	.049	.049	36
6	6	8	8	.041	.041	30
6	6	9	9	.035	.035	25
6	6	10	10	.029	.029	21
6	6	12	12	.017	.017	13
4	4	4	4	.120	.120	85
4	4	6	6	.087	.087	62
4	4	8	8	.062	.062	44
4	4	10	10	.043	.043	31
4	4	12	12	.026	.026	19
4	4	14	14	.015	.015	11
3	3	10	10	.057	.057	41
3	3	12	12	.035	.035	25
2	2	10	10	.086	.086	60
2	2	12	12	.052	.052	37
2	2	14	14	.030	.030	21
2	2	16	16	.018	.018	13
2	4	12	12	.052	.026	28
2	4	14	14	.030	.015	16

*Other styles can be furnished on application.

Rolls: Standard lengths 150, 200 and 300 ft. For No. 2 gauge wires and larger, flat sheets only.

Widths: Multiples of the spacing of longitudinal wires up to a maximum width which varies with the size and spacing of the longitudinal. Approximate maximums 56 to 72 in. for 2-in. spacing, 84 to 96 in. for 3 or 4-in. spacing, and 96 to 120 in. for 6-in. spacing.

Finish: Plain or galvanized.

Tensile Strength: As specified in A.S.T.M. Standard Specifications A82—27.

Weights—All above weights are based on a width of 60 in. measured from center to center of the outside or selva longitudinal wires.

CONCRETE STEEL COMPANY

2 Park Avenue, NEW YORK, N. Y.

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Products

CONCRETE REINFORCEMENT BARS; COLLAPSIBLE SPIRALS for column reinforcement; REMOVABLE METAL FORMS; CONCRETE INSERTS; CURB BARS; CONCRETE REINFORCEMENT DEVICES, including SUPPORTING, SPACING and TYING DEVICES for holding bars in place in forms; WIRE DEVICES; WIRE SOFFIT CLIPS; WALL ANCHORS and TIES; EXPANDED METAL LATH (Plain and Self-furring); EXPANDED METAL REINFORCEMENT; HOT ROLLED and COLD FORMED CHANNELS; CORNER BEADS; RIB LATH; HAVEMEYER STEEL JOISTS.

Havemeyer Concrete Reinforcement Bars

These deformed bars (Figs. 1 and 2) are rolled in square and round sections, with the deformations running longitudinally and entering directly into the tensile strength of the bar, no metal being used for the mechanical bond only. At all points they have constant uniform area of cross section exactly



Fig. 1. Round



Fig. 2. Square

equal to the cross-sectional area of a plain bar of same size. As the projections and depressions are rolled longitudinally, there are no sharp angles to start a fracture when bar is bent.

Specifications for Steel—Havemeyer bars are rolled to any desired standard specification from new billet steel.

Shop Bending and Fabricating—Our warehouses are equipped for bending and fabricating bars. This service not only insures greater accuracy but is more economical for the contractor than if he did the work himself.

Collapsible Spirals

Accurately coiled, rigidly spaced and shipped collapsed, ready to be opened up and placed in the forms.

Removable Metal Forms

Removable metal forms, in a wide range of dimensions,



adapted to all types of buildings designed for concrete joists, are available to contractors on a rental basis.

Concrete Inserts

Dayton Adjustable-Inserts, with keyhole slot for adjustment; Havemeyer "Y" Socket-Inserts; Havemeyer Slotted-Inserts, unlimited adjustment obtainable.

Havemeyer Curb Bars

We make round nose and angle nose curb bars for curb edge protection, stair nosings and platform edges.

Havemeyer Devices for Supporting, Spacing and Tying Bars in Forms

Consist of Bar-Tys, Hy-Chairs, Ty-Chairs, Easel-Chairs, Sheet Metal and Welded Wire Bar-Spacers, Beam-Saddle and Separators, and Joist Chairs.

These devices permit economies in the placing of reinforcing steel and insure the accurate position of bars in the forms during concreting.

Wire Devices

Soffit clips; hanger wire, straight, cut and bent, toggle hangers, etc.

Our wire shops are prepared to manufacture, on short notice, any type of wire device required for the installation of suspended ceilings or for securing lath. Tie wire, staples, etc., carried in stock.

Security Anchor and Wall-Tys

For bonding brick veneer, stone, terra cotta and tile wainscoting to walls, etc.; for suspending metal lath ceilings and for holding floor sleepers, screeds, nailing strips, etc.

Havemeyer Fireproofing Products

Metal Lath—Flat expanded, flat rib, $\frac{3}{8}$ -in. rib, $\frac{1}{4}$ -in. rib and perforated sheet.

Furring—Hot rolled channels, angles and flats. Cold rolled channels, $\frac{3}{4}$, 1, $1\frac{1}{2}$ and 2 ins.

Corner Beads—Expanded, wing, rail and bullnose types. Lengths, 6, 7, 8, 9, 10 and 12 ft.

Base Beads—Expansion, plain and curved point.

Wire Mesh—Both triangle and electric weld, plain and galvanized, all standard weights and areas.

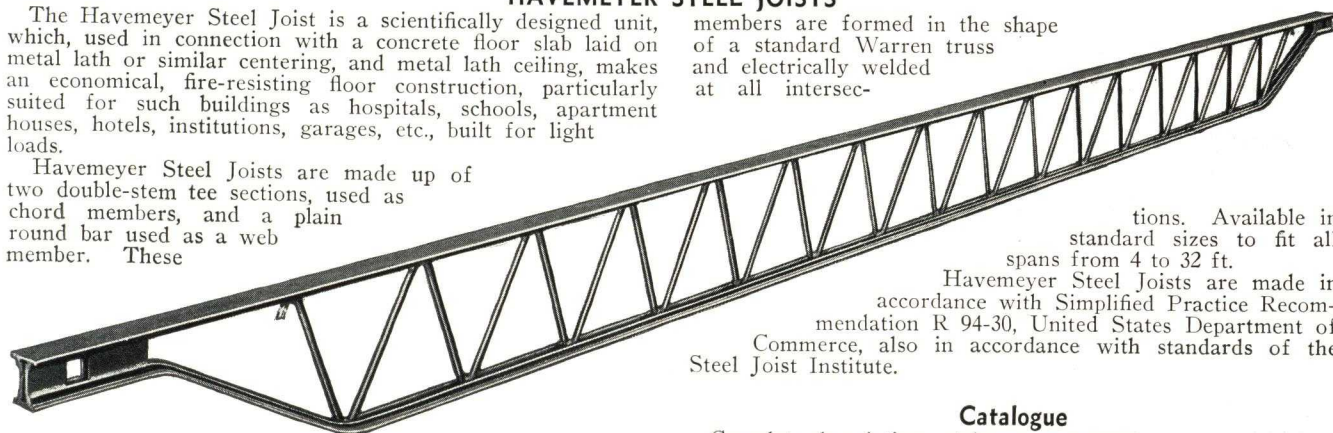
Expanded Metal—Complete information furnished on request.

HAVEMEYER STEEL JOISTS

The Havemeyer Steel Joist is a scientifically designed unit, which, used in connection with a concrete floor slab laid on metal lath or similar centering, and metal lath ceiling, makes an economical, fire-resisting floor construction, particularly suited for such buildings as hospitals, schools, apartment houses, hotels, institutions, garages, etc., built for light loads.

Havemeyer Steel Joists are made up of two double-stem tee sections, used as chord members, and a plain round bar used as a web member. These

members are formed in the shape of a standard Warren truss and electrically welded at all intersec-



tions. Available in standard sizes to fit all spans from 4 to 32 ft.

Havemeyer Steel Joists are made in accordance with Simplified Practice Recommendation R 94-30, United States Department of Commerce, also in accordance with standards of the Steel Joist Institute.

Catalogue

Complete descriptive catalogue on request.

THE CONSOLIDATED EXPANDED METAL COMPANIES

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PITTSBURGH, PA., 6626 Hamilton Avenue

EXPORT OFFICE, 152 West 42nd Street, NEW YORK, N. Y.

Products

EXPANDED METAL CONCRETE REINFORCEMENT; EXPANDED METAL for Machine Guards, Open Mesh Partitions, Window Guards and Bank Vaults.

We also manufacture Expanded Metal Road Mesh, Stucco Reinforcement, Metal Lath and Welded Wire Fabric Concrete Reinforcing.

Steelcrete Expanded Metal Reinforcement

Steelcrete Expanded Metal Reinforcement is an expanded metal product—*not welded*. It is cold drawn from a solid plate of steel and has a guaranteed elastic limit 60% higher than commercial medium steel. It costs less "in place" than materials having lower reinforcing values.

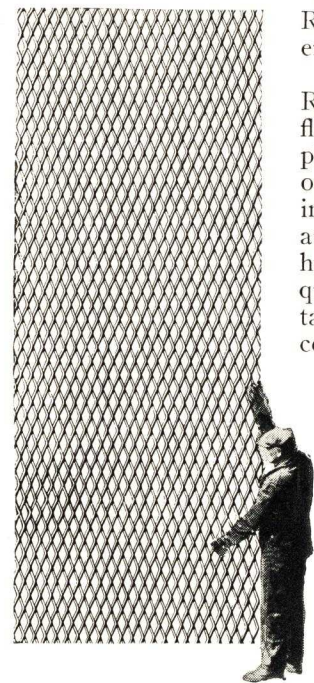
The reinforcing efficiency of Steelcrete Expanded Metal has been tested time and time again. The Holland Vehicular Tunnel is a splendid example. This great "driveway" under the Hudson River is reinforced below water entirely with Steelcrete.

Steelcrete Expanded Metal Reinforcement comes in large flat sheets which are easily placed. It is adaptable to various types of construction, being supplied in weights which are especially suitable where a heavy reinforcement is required, such as, floors, tunnels, tanks, culverts, retaining walls, conduits and sewers.

Steelcrete Bank Vault Protection

Steelcrete Bank Vault Protection consists of thick mats of extra heavy expanded metal mesh which are embedded in floors, walls and ceilings of concrete bank vault enclosures. Special low insurance rate.

Specifications furnished on request.



Steelcrete Is Furnished in Large, Flat Sheets

Steelcrete Safe-T-Mesh for Window Guards, Machine Guards and Partitions

Steelcrete Safe-T-Mesh is a diamond mesh fabric for building open mesh partitions, window guards and

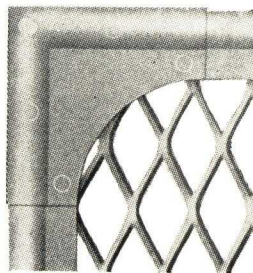


machine guards. This material is guaranteed to be free from sharp edges.

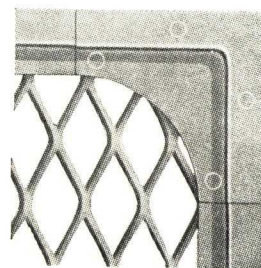
We also produce heavy tube shaped sections known as Steelcrete Partition Bar and Frame Bar, which are suitable for framing Steelcrete into strong, attractive panels; also accessories for joining Steelcrete Partition Bar and Frame Bar at corners; other accessories for quickly attaching the panels to the building structure.

All are illustrated in "Steelcrete Industrial Mesh Hand Book."

We furnish the material in large, flat sheets, and the accessories in package lots, plain or galvanized finish.



Corner Assembly of Steelcrete Industrial Mesh and Steelcrete Frame Bar.



Corner Assembly of the Steelcrete Industrial Mesh and Steelcrete Partition Bar.

Steelcrete Welded Wire Fabric

Steelcrete Welded Wire Fabric is an electrically welded wire fabric furnished in rolls or flat sheets in various gauges and spacing of wires.

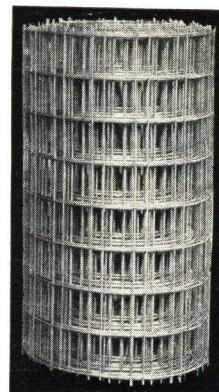
The wire is manufactured to the specifications of the American Society for Testing Materials.

Booklets

"Steelcrete Industrial Mesh Hand Book"—Complete data on Steelcrete and Accessories for industrial uses, including window guards, machine guards and factory partitions.

"Steelcrete Concrete Engineers Handbook"—250 pages of design data and tables for the designing engineer.

"Time Tested Products"—General catalogue.



Welded Wire in Rolls or Sheets

FOUNDED 1850

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Products

J & L BARS for Concrete Reinforcement.

Also J & L Structural Shapes and Fabricated Structural Work, Columns, Girders, Trusses, Plate Work, Tanks, Mill and Factory Buildings; J & L Junior Beams; J & L Wire Products.

For Steel Piling, Light Weight Channels for Stair Stringers and other uses, and Tubular Products, see page numbers in Manufacturers' Index.

Description—Concrete Reinforcement Bars

J & L Diamond Bars are rolled from new billet steel and are tested to standard specifications. Each has uniform cross section, without offset, carrying the stresses evenly. Ribs are clean cut and accurate, balancing each other in two opposite spirals. The ribs run at angles of 45°, giving maximum areas to insure bond.

There are no sharp edges or corners, thereby assuring intimate and thorough contact with the concrete. Sizes are easily identified, round sections for the standard round equivalents, gothic sections for the standard square equivalents.



J & L Round Equivalent Deformed



J & L Square Equivalent Deformed

STANDARD SIZES CONCRETE REINFORCEMENT BARS

Size, in.	Area, sq. in.
* 1/4 round	0.05
3/8 round	0.11
1/2 round	0.20
5/8 round	0.25
3/4 round	0.31
7/8 round	0.44
1 round	0.60
1 square	0.79
1 1/8 square	1.00
1 1/4 square	1.27
1 1/2 square	1.56

*Furnished in plain round.



Column Spirals

Spirals are fabricated with two or more channel spacers as desired. This permits the

spirals to be shipped collapsed ready to set in forms.

STANDARD SIZES SPIRAL WIRE

Size, in., plain round	Area, sq. in.
1/4	0.05
3/8	0.11
1/2	0.20
5/8	0.31



Collapsed

Set Up

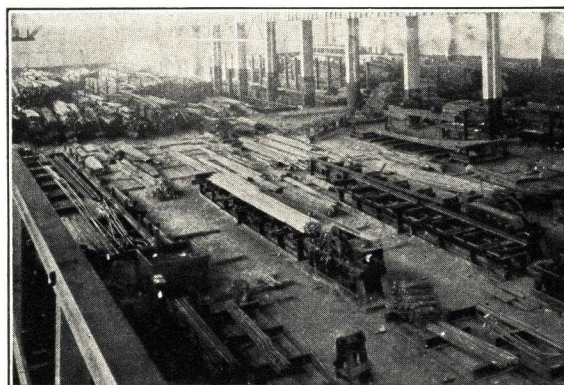
A complete stock of standard sizes is carried in both hot rolled and cold drawn wire.

Quick shipment assured.

Warehouse Service

We carry large stocks of reinforcing bars, so that unusual requirements, as well as those of ordinary nature, are taken care of promptly.

We are in a position to cut and bend bars in accordance with bar lists and bending details as submitted.



Bar Bending Bay, J & L Concrete Reinforcement Bar Warehouse, Pittsburgh, Pa.

WICKWIRE SPENCER STEEL COMPANY

GENERAL OFFICES

41 East Forty-second Street, NEW YORK, N. Y.

OFFICES AND WAREHOUSES

WORCESTER, MASS., 80 Webster St.
BUFFALO, N. Y., River Road
CHICAGO, ILL., 221 No. La Salle St.

TULSA, OKLA., 314 E. Archer St.
SAN FRANCISCO, CAL., 144 Townsend St.

LOS ANGELES, CAL., 1070 No. Alameda St.
SEATTLE, WASH., 1025 Sixth Ave., South
PORTLAND, ORE., 361 14th St., North

Products

CLINTON ELECTRICALLY WELDED WIRE FABRIC for Concrete Reinforcement.

Also WIRE ROPE and FITTINGS.

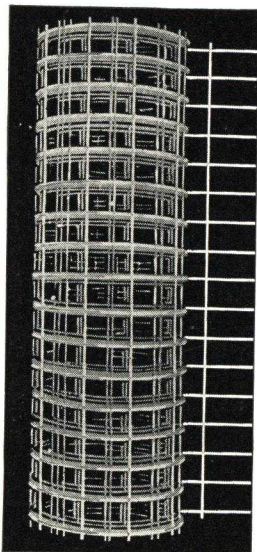
For our page on Wire and Iron Fences and Gates, see Manufacturers' Index.

Clinton Electrically Welded Wire Fabric

Scope of Use—Clinton Electrically Welded Wire Fabric, a mesh reinforcement, is especially satisfactory for floors, walls, roads, sidewalks, sewers, reservoirs, levees and all forms of slab construction work.

When used to strengthen floor slabs the large longitudinal wires are located in the line of greatest tension. The transverse, or secondary members, arranged at right angles to them, afford a most efficient means of distributing concentrated loads in a direction perpendicular to the main reinforcing members.

Because of its efficient lateral, as well as longitudinal strength, Clinton Welded Wire Fabric prevents cracking due to changes in temperature.



Roll of Clinton Electrically Welded Wire, 48-in. Width

Shipped also in sheets if desired

Material—It is a rectangular wire mesh with its points of intersection securely welded by a patented electrical process. It is furnished in virtually any size of wire.

The fabric is manufactured from a special grade of high quality steel wire possessing such strength, elasticity and ductility as to render it ideally suited to structural use. The wire possesses an average ultimate strength of 65,000 to 75,000 lbs.

Finish—Clinton Electrically Welded Fabric is furnished either in plain steel or galvanized.

Economy and Accuracy of Installation—The fabric is delivered in rolls and may be laid in continuous sheets up to 200 ft. in length, or may be furnished in sheets of desired length. There are no weak joints, no lapped ends, no waste. Great quantities can be laid quickly and accurately by unskilled labor, with the assurance that every strand is in its proper position. It is therefore a simple, safe, most economical reinforcing material for all forms of slab construction.

SLAB REINFORCEMENT UNDER NEW YORK, N. Y., CODE

Sectional area of steel reinforcement required, square inches per foot in width, for concrete arches of various spans based on Clinton Electrically Welded Fabric

Total load in lb. per sq. ft. including weight of slab	Spans, in feet and inches																
	4-0	4-3	4-6	4-9	5-0	5-3	5-6	5-9	6-0	6-3	6-6	6-9	7-0	7-3	7-6	7-9	8-0
4-inch Cinder Concrete Slab, 1-2-5 Mixture																	
100	.043	.043	.043	.043	.043	.043	.043	.043	.043	.052	.052	.062	.062	.074	.074	.074	.087
125	.043	.043	.043	.043	.043	.043	.052	.052	.062	.062	.074	.074	.087	.087	.101	.101	.101
150	.043	.043	.043	.043	.043	.052	.052	.062	.062	.074	.074	.087	.087	.101	.101	.120	.120
175	.043	.043	.043	.052	.062	.062	.074	.074	.087	.087	.101	.101	.120	.120	.140	.140	.140
200	.043	.052	.052	.062	.062	.074	.074	.087	.101	.101	.120	.120	.140	.140	.147	.162	.162
225	.052	.052	.062	.062	.074	.087	.087	.101	.101	.120	.120	.140	.140	.147	.162	.174	.202
250	.052	.062	.062	.074	.087	.087	.101	.120	.120	.140	.140	.147	.162	.174	.174	.202	.202
275	.062	.062	.074	.087	.087	.101	.120	.120	.140	.140	.147	.162	.174	.202	.202	.239	.239
300	.062	.074	.074	.087	.101	.120	.120	.140	.140	.147	.162	.174	.202	.202	.239	.239	.259
325	.074	.074	.087	.101	.101	.120	.140	.140	.147	.162	.174	.202	.202	.239	.239	.259	.280
350	.074	.087	.087	.101	.120	.120	.140	.147	.162	.174	.202	.202	.239	.239	.259	.280	.280
375	.074	.087	.101	.120	.120	.140	.147	.162	.174	.202	.202	.239	.239	.259	.280	.302	.302
400	.087	.101	.101	.120	.140	.140	.162	.174	.202	.202	.239	.239	.259	.280	.280	.302	.330
425	.087	.101	.120	.120	.140	.147	.162	.202	.202	.239	.239	.259	.259	.280	.302	.330	.359
450	.101	.101	.120	.140	.147	.162	.174	.202	.239	.239	.259	.259	.280	.302	.330	.359	.389
4-inch Stone or Gravel Concrete Slab, 1-2-4 Mixture or Equal																	
100	.043	.043	.043	.043	.043	.043	.043	.043	.043	.043	.052	.052	.062	.062	.062	.062	.074
125	.043	.043	.043	.043	.043	.043	.043	.043	.043	.052	.062	.062	.074	.074	.087	.087	.087
150	.043	.043	.043	.043	.043	.043	.052	.052	.062	.062	.074	.074	.087	.087	.101	.101	.120
175	.043	.043	.043	.043	.052	.052	.062	.062	.074	.074	.087	.087	.101	.101	.120	.120	.140
200	.043	.043	.043	.052	.052	.062	.074	.074	.087	.087	.101	.101	.120	.120	.140	.140	.140
225	.043	.043	.052	.062	.062	.074	.074	.087	.087	.101	.120	.120	.140	.140	.147	.162	.162
250	.043	.052	.062	.062	.074	.074	.087	.101	.101	.120	.120	.140	.140	.147	.162	.162	.174
275	.052	.062	.062	.074	.087	.087	.101	.101	.120	.120	.140	.140	.147	.162	.174	.202	.202
300	.052	.062	.074	.074	.087	.087	.101	.120	.120	.140	.140	.147	.162	.174	.202	.202	.239
325	.062	.062	.074	.087	.101	.101	.120	.120	.140	.140	.162	.162	.174	.202	.202	.239	.239
350	.062	.074	.087	.087	.101	.120	.120	.140	.140	.147	.162	.174	.202	.202	.239	.239	.259
375	.074	.074	.087	.101	.120	.120	.140	.140	.147	.162	.174	.202	.202	.239	.239	.259	.280
400	.087	.087	.087	.101	.120	.120	.140	.147	.162	.174	.202	.202	.239	.239	.259	.280	.280
425	.087	.087	.101	.120	.120	.140	.147	.162	.174	.202	.202	.239	.239	.259	.259	.280	.302
450	.087	.087	.101	.120	.140	.140	.147	.162	.202	.202	.239	.239	.259	.259	.280	.302	.330

STANDARD SIZES—CLINTON WELDED FABRIC

Style No.	Spacing of wires		Size wires W. & M. gauge		Sec. area of steel per ft. width, sq. in.		Wt., per 100 sq. ft., lb.	Standard rolls	
	Longitudinal, in.	Transverse, in.	Longitudinal	Transverse	Longitudinal	Transverse		Width, in.	Length, ft.
*216-28	2	16	2	8	.325	.015	119.4	60	150
*216-38	2	16	3	8	.280	.015	103.6	60	150
*216-49	2	16	4	9	.239	.013	88.5	60	150
*216-510	2	16	5	10	.202	.011	74.6	60	150
*216-610	2	16	6	10	.174	.011	64.7	60	200
*316-28	3	16	2	8	.217	.015	82.6	84	150
*316-38	3	16	3	8	.187	.015	72.0	84	150
*316-49	3	16	4	9	.160	.013	61.4	84	150
*316-510	3	16	5	10	.135	.011	51.8	84	150
*316-610	3	16	6	10	.116	.011	45.1	84	200
*416-38	4	16	3	8	.140	.015	56.1	84	150
*416-49	4	16	4	9	.120	.013	47.9	84	150
*416-510	4	16	5	10	.101	.011	40.4	84	200
*416-610	4	16	6	10	.087	.011	35.2	84	200
*416-711	4	16	7	11	.074	.009	29.7	84	200
*412-812	4	12	8	12	.062	.009	25.5	84	200
*412-912	4	12	9	12	.052	.009	21.8	84	200
*412-1012	4	12	10	12	.043	.009	18.6	100	300
*412-1212	4	12	12	12	.026	.009	12.6	100	400
412-55	4	12	5	5	.101	.034	48.4	72	200
412-66	4	12	6	6	.087	.029	41.6	72	200
412-77	4	12	7	7	.074	.025	35.4	72	200
412-88	4	12	8	8	.062	.021	29.6	72	200
*59-1212	5	9	12	12	.021	.012	11.8	100	400
612-06	6	12	0	6	.148	.029	65.3	72	†
612-33	6	12	3	3	.093	.047	51.2	72	200
612-44	6	12	4	4	.080	.040	43.8	72	200
612-55	6	12	5	5	.067	.034	37.0	72	200
612-66	6	12	6	6	.058	.029	31.8	72	200
612-77	6	12	7	7	.049	.025	27.0	72	200
22-1010	2	2	10	10	.086	.086	60.3	56	200
*22-1212	2	2	12	12	.052	.052	36.8	56	300
44-44	4	4	4	4	.120	.120	85.3	84	150
44-66	4	4	6	6	.087	.087	61.9	84	150
44-88	4	4	8	8	.062	.062	44.1	84	200
66-44	6	6	4	4	.080	.080	57.8	84	200
66-55	6	6	5	5	.067	.067	48.8	84	200
*66-66	6	6	6	6	.058	.058	42.0	84	200
66-77	6	6	7	7	.049	.049	35.7	84	200
*66-88	6	6	8	8	.041	.041	30.0	84	200
*66-1010	6	6	10	10	.029	.029	20.7	96	300

*Denotes sizes ordinarily carried in stock. †Shipped only in flat sheets.

REINFORCED CONCRETE SLAB TABLES

Values in all these tables indicate size of mesh and gauge of wires in Clinton Fabric. Thus, 4x16, 7&11 indicates a fabric having No. 7 gauge longitudinal wires on 4-in. centers welded to No. 11 gauge transverse wires on 16-in. centers.

Reinforcements below and to left of zigzag lines may also be safely used in cinder concrete without exceeding 300 lbs. per sq. in. compression in the concrete. In using cinder concrete, applied loads as given may be increased 3½ lbs. for each inch thickness of slab.

Table I. Applied Load 50 Lbs. per Sq. Ft.

Thickness of slab, in.	Concrete below steel, in.	Clinton Fabric required										
		Span of slab in feet										
		4	5	6	7	8	9	10	11	12	13	14
3½	¾	4x12 9&12	4x12 9&12	4x16 7&11	4x16 5&10	4x16 4&9	3x16 4&9	.....	.....	.....	.....	.....
4	¾	4x12 9&12	4x12 9&12	4x16 8&12	4x16 6&10	4x16 5&10	3x16 3&8	.....	.....	.....	.....	.....
4½	¾	.....	.....	4x12 8&12	4x16 7&11	4x16 5&10	3x16 3&8	2x16 5&10	.....	.....	.....	.....
5	1	.....	.....	.....	4x16 7&11	4x16 5&10	3x16 3&8	2x16 4&9	.....	.....	.....	.....
6	1	.....	.....	.....	.....	4x16 7&11	4x16 5&10	3x16 3&8	2x16 4&9	2x16 3&8	.....	.....
7	1	.....	.....	.....	.....	.....	4x16 6&10	4x16 5&10	3x16 3&8	2x16 4&9	2x16 3&8	.....
8	1¼	.....	.....	.....	.....	.....	.....	4x16 5&10	4x16 4&9	3x16 3&8	2x16 4&9	2x16 3&8

Table II. Applied Load 75 Lbs. per Sq. Ft.

Thickness of slab, in.	Concrete below steel, in.	Clinton Fabric required										
		Span of slab in feet										
		4	5	6	7	8	9	10	11	12	13	14
3½	¾	4x12 9&12	4x12 8&12	4x16 6&10	4x16 4&9	3x16 4&9	.....	.....	.....	.....	.....	.....
4	¾	4x12 9&12	4x12 8&12	4x16 7&11	4x16 5&10	3x16 3&8	.....	.....	.....	.....	.....	.....
4½	¾	.....	4x12 9&12	4x16 7&11	4x16 5&10	3x16 3&8	2x16 5&10	.....	.....	.....	.....	.....
5	1	.....	.....	4x16 7&11	4x16 5&10	3x16 3&8	2x16 4&9	.....	.....	.....	.....	.....
6	1	.....	.....	.....	4x16 8&12	4x16 5&10	3x16 3&8	2x16 4&9	2x16 3&8	.....	.....	.....
7	1	.....	.....	.....	.....	4x16 7&11	4x16 5&10	3x16 3&8	2x16 4&9	2x16 3&8	.....	.....
8	1¼	.....	.....	.....	.....	.....	4x16 6&10	4x16 5&10	3x16 3&8	2x16 4&9	2x16 3&8	.....

REINFORCED CONCRETE SLAB TABLES (Continued)

Table III. Applied Load 100 Lbs. per Sq. Ft.

Thickness of slab, in.	Concrete below steel, in.	Clinton Fabric required										
		Span of slab in feet										
		4	5	6	7	8	9	10	11	12	13	14
3½	¾	4x12 9&12	4x16 7&11	4x16 5&10	3x16 4&9	.....	.....	.....	.....	.....	.....	.....
4	¾	4x12 9&12	4x12 8&12	4x16 6&10	3x16 5&10	3x16 3&8	2x16 4&9	.....	.....	.....	.....	.....
4½	¾	.....	4x12 8&12	4x16 6&10	3x16 5&10	3x16 4&9	3x16 3&8	2x16 4&9	.....	.....	.....	.....
5	1	.....	.....	4x16 6&10	3x16 5&10	3x16 4&9	3x16 3&8	2x16 4&9	2x16 3&8	.....	.....	.....
6	1	.....	.....	.....	4x16 7&11	4x16 5&10	3x16 4&9	3x16 3&8	2x16 4&9	2x16 3&8	2x16 1&7	.....
7	1	.....	.....	.....	.....	4x16 6&10	4x16 5&10	3x16 4&9	3x16 3&8	2x16 4&9	2x16 3&8	2x16 1&7
8	1¼	.....	.....	.....	.....	.....	4x16 5&10	4x16 4&9	3x16 3&8	2x16 4&9	2x16 3&8	2x16 2&8

Table IV. Applied Load 125 Lbs. per Sq. Ft.

Thickness of slab, in.	Concrete below steel, in.	Clinton Fabric required										
		Span of slab in feet										
		4	5	6	7	8	9	10	11	12	13	14
3½	¾	4x12 8&12	4x16 6&10	4x16 5&10	3x16 3&8	.....	.....	.....	.....	.....	.....	.....
4	¾	.....	4x16 7&11	3x16 6&10	3x16 4&9	2x16 5&10	.....	.....	.....	.....	.....	.....
4½	¾	.....	.....	4x16 7&11	4x16 5&10	3x16 3&8	3x16 4&9	2x16 4&9	.....	.....	.....	.....
5	1	.....	.....	.....	4x16 5&10	3x16 3&8	3x16 4&9	2x16 3&8	2x16 4&9	.....	.....	.....
6	1	.....	.....	.....	.....	4x16 6&10	4x16 5&10	3x16 3&8	3x16 4&9	2x16 3&8	2x16 1&7	.....
7	1	.....	.....	.....	.....	.....	4x16 5&10	4x16 4&9	3x16 3&8	2x16 4&9	2x16 3&8	2x16 1&7
8	1¼	.....	.....	.....	.....	.....	.....	4x16 4&9	4x16 3&8	3x16 3&8	2x16 4&9	2x16 3&8

Table V. Applied Load 150 Lbs. per Sq. Ft.

Thickness of slab, in.	Concrete below steel, in.	Clinton Fabric required										
		Span of slab in feet										
		4	5	6	7	8	9	10	11	12	13	14
3½	¾	4x12 8&12	4x16 5&10	4x16 4&9	3x16 4&9	.....	.....	.....	.....	.....	.....	.....
4	¾	.....	4x16 6&10	4x16 4&9	3x16 3&8	2x16 3&8	.....	.....	.....	.....	.....	.....
4½	¾	.....	.....	4x16 7&11	4x16 4&9	3x16 3&8	2x16 5&10	.....	.....	.....	.....	.....
5	1	.....	.....	.....	4x16 5&10	3x16 3&8	3x16 4&9	2x16 3&8	2x16 4&9	.....	.....	.....
6	1	.....	.....	.....	.....	4x16 6&10	4x16 5&10	3x16 3&8	3x16 4&9	2x16 3&8	2x16 1&7	.....
7	1	.....	.....	.....	.....	.....	4x16 5&10	4x16 4&9	3x16 3&8	2x16 4&9	2x16 3&8	2x16 1&7
8	1¼	.....	.....	.....	.....	.....	.....	4x16 4&9	4x16 3&8	3x16 3&8	2x16 4&9	2x16 3&8

Table VI. Applied Load 200 Lbs. per Sq. Ft.

Thickness of slab, in.	Concrete below steel, in.	Clinton Fabric required										
		Span of slab in feet										
		4	5	6	7	8	9	10	11	12	13	14
3½	¾	4x16 6&10	3x16 5&10	3x16 4&9	.....	.....	.....	.....	.....	.....	.....	.....
4	¾	4x16 7&11	3x16 6&10	3x16 4&9	2x16 3&8	.....	.....	.....	.....	.....	.....	.....
4½	¾	4x12 8&12	4x16 5&10	3x16 4&9	3x16 3&8	2x16 3&8	.....	.....	.....	.....	.....	.....
5	1	.....	4x16 6&10	3x16 5&10	3x16 4&9	2x16 3&8	2x16 4&9	.....	.....	.....	.....	.....
6	1	.....	.....	4x16 5&10	3x16 4&9	3x16 3&8	2x16 3&8	2x16 4&9	.....	.....	.....	.....
7	1	.....	.....	.....	3x16 5&10	3x16 4&9	2x16 3&8	2x16 4&9	2x16 3&8	.....	.....	.....
8	1¼	.....	.....	.....	.....	3x16 4&9	2x16 3&8	2x16 4&9	2x16 3&8	2x16 1&7	2x16 0&6	.....

Table VII. Applied Load 250 Lbs. per Sq. Ft.

Thickness of slab, in.	Concrete below steel, in.	Clinton Fabric required				
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STRUCTURAL GYPSUM CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

Manufacturers of Gypsteel Gypsum Pre-cast Roofs, Floors and Plank

TELEPHONE
Vanderbilt 3-4320

GENERAL OFFICE
535 Fifth Avenue, NEW YORK, N. Y.

FACTORIES: LINDEN, N. J. and AKRON, N. Y.
BRANCH OFFICES IN PRINCIPAL EASTERN CITIES

Products

GYPSTEEL GYPSUM PLANK (as described on following pages).

GYPSTEEL GYPSUM PRE-CAST ROOFS (as described on following pages).

GYPSTEEL GYPSUM PRE-CAST FLOORS and CEILINGS and GYPSTEEL GYPSUM PRE-CAST FLOOR ARCH for all classes of fireproof buildings.

GYPSTEEL GYPSUM PARTITION TILE, BEAM and COLUMN COVERING.

GYPSTEEL GYPSUM PLASTERS.

ZENITHERM, a factory pressed, decorative wall and floor material, in 21 colors and mottled texture resembling the finest of building stones. Nailed or bedded in place by carpenters over wood or masonry. Resilient, colorful, quiet and decorative.



TRADE-MARK

Services

This corporation welcomes the privilege of consulting with engineers, architects and owners as to the best methods of utilizing its various types of roofs on any building.

Through its certified erectors, it submits proposals for the installation of its products by experienced workmen.

Literature

Complete bulletins on all Gypsteel products, giving details, specifications and other information, are available upon request, from any of our offices.

Service sheets are also prepared for each type of product. These supply, in concise form, all necessary data for designers and specification writers.

GYPSTEEL FIREPROOF GYPSUM PLANK AND PRE-CAST GYPSUM ROOFS

Gypsteel Fireproof Gypsum Plank

This is an original product developed by STRUCTURAL GYPSUM CORPORATION to meet the demand for a light, yet strong fireproof material, with the advantages of ordinary wood plank. It is absolutely incombustible, yet possesses all the adaptability, workability and economy for structural purposes characteristic of lumber. It is a real plank, meeting practically all the demands of building construction (except permanent exposure to the elements) that its wood competitor satisfies. It may be nailed, sawed, cut or bored with practically the same ease as wood plank. It is a structural product, an insu-

lator and a superior plaster base, *all in one*, and is recommended for floors, roofs, sheathing, furring, partitions and ceilings in all classes of wood and steel frame buildings.

Gypsteel Pre-cast Gypsum Roofs

The many advantages of pre-cast gypsum construction for roofs of industrial buildings, churches, apartments, schools, office buildings, etc., are recognized today more widely than ever. Gypsteel Gypsum Roofs enable the designer to achieve maximum efficiency in design with certain economies that, we believe, cannot be achieved with any other roof construction.

Advantages of Gypsteel Pre-cast Roofs and Gypsteel Plank

(1) Savings in Fuel and Heating Plant

The composition used in Gypsteel Gypsum Plank offers the highest insulation against the transmission of heat of any structural material. Unbiased authorities concede that 2 in. of gypsum composition such as used in Gypsteel Plank is the equivalent in insulating value of approximately 9 in. or 10 in. of concrete, or of an 8 in. brick wall.

Therefore, the use of a Gypsteel Pre-cast Roof guarantees to the owner a minimum heat loss through the roof. In heated buildings this insures a substantial annual reduction in the amount of fuel consumed for heating, as well as marked saving in the capacity and cost of the heating plant required, both as to the amount of radiation surface and the size of the boiler plant needed. The combined savings frequently exceed, in a few years, the entire cost of the roof.

(2) Strength and Safety

Each type of Gypsteel Pre-cast Roof is based upon the most conservative design.

Short Span Type—The short span slabs are carried by rolled steel sections, designed in accordance with the standard practice of the A.I.S.C. These slabs span only 30 in. and by actual tests of recognized laboratories will safely sustain many times the normal roof loads.

Long Span Suspension Type—This construction is based upon the principle of the suspension bridge; continuous cold drawn steel cables anchored at the eaves to the steel frame carry the entire load.

(3) Fire Resistance

The gypsum composition used in Gypsteel Pre-cast products is universally accepted as the highest class of fireproofing material. This has been proven by extensive tests.

(4) Economy and Lightness

The extremely light weight of Gypsteel Pre-cast Roofs and Planks permits of a substantial reduction in the weight of supporting steel, as compared to many other types of fireproof roof construction.

(5) Preventing Condensation and Drip

With Gypsteel Pre-cast Long Span Roof construction, the full thickness of the Gypsteel slab extends over the top of all supporting steel, and by reason of its high insulating value prevents condensation under conditions of humidity and differences in indoor and outdoor temperatures that cause drip on most other types of roofs.

(6) Attractive Appearance

The smooth undersurface of Gypsteel Pre-cast Roof Slabs and Gypsteel Plank gives an attractive appearance, increased light reflection, and does not collect dirt or dust.

(7) Speed and Ease of Installation

Absence of form work and water speeds installation. Roof decks can be erected as rapidly as the steel work permits. Waterproofing can follow at once.

(8) Winter Work

Gypsteel Pre-cast Roofs and Plank can be installed in any weather in which men can work.

(9) Durability and Longevity

A Gypsteel Roof eliminates repairs, maintenance and renewals. Gypsum Roofs have an enviable record of over 20 years successful service.

(10) Non-expansiveness

Gypsum has a coefficient of expansion of practically zero.

(11) Resistance to Vibration

Gypsteel Pre-cast Roofs and Plank resist vibration because of their toughness and elasticity. All types are so designed that it is practically impossible to unseat them under even unusual service conditions.

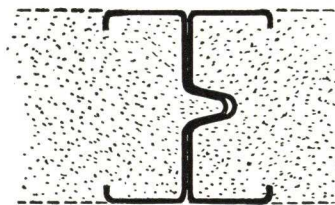
GYPSTEEL FIREPROOF GYPSUM PLANK**For Floor, Roof, Partition, Furring and Sheathing****Description**

For many years the building industry has sought a satisfactory substitute for wood that would be not only incombustible but would possess all of the characteristic advantages of wood lumber. *Gypsteel Fireproof Gypsum Plank is an outstanding contribution towards this end.*

Made in Two Sizes

Two sizes of plank are offered. Each consists of a solid slab of factory-cast, dense gypsum, 2 in. thick and 15 in. wide, bound and reinforced on the sides with channel-like sections of galvanized, copper-bearing steel, tongued and grooved like wood plank. *Senior Plank*, 10 ft. long, for long spans or heavy loads, has the same tongued and grooved binding carried across the ends; *Junior Plank*, 6 ft. long, for shorter spans, has a gypsum shiplapped joint at the ends.

The channel-shaped, tongued and grooved steel binding is permanently anchored to the gypsum on both sides and ends by turned-down edges which add strength to the sections and protect the edges of the steel from corrosion. When the planks are set in place, these tapered steel tongues and grooves mesh together to form an I-beam, a strong structural shape, continuous across supports, which gives unusual strength. When used for floors or roofs, the gypsum core is, in addition, reinforced against impact with galvanized wire mesh.



Section Showing How Plank Mesh to Form Beams

Advantages

- 1—Gypsteel Plank may be nailed, sawed, cut or bored as readily as wood.
- 2—There is no waste because of laps or cutting; the shortest piece may be used.
- 3—No area is lost for tongues or grooves, or for "dressing."
- 4—Breakage is negligible.
- 5—It is easy to handle and erect.
- 6—It is easily and quickly secured to any type frame using ordinary spikes or galvanized steel clips of simple design furnished by the manufacturer.
- 7—It will not rot, shrink or warp; it is vermin-proof.
- 8—It is absolutely incombustible.
- 9—It has unusually high insulating properties.
- 10—It eliminates form work and water in construction; there is no waiting for materials to "set."

Replacements

Gypsteel Gypsum Plank offers an economical and rapid means of replacing worn out factory roofs.

This repair work can be done without interruption to your production, without the inconvenience of form work and dripping water, and without exposing your machinery to the weather.

The old roof may be removed in sections and replaced with Gypsteel Gypsum Plank, which may be waterproofed immediately. And this permanent, fireproof roof may be had at a cost little greater than that of wood.

Gypsteel Plank Applications

Gypsteel Gypsum Plank has many uses in all classes of wood or steel-frame buildings. Some of these are:

Roof Construction

For laying directly over wood or steel purlins of any type and either uniform or variable spacing for spans up to 7 ft. Plank is erected without regard to joist spacing by staggering

end joints. *Joints need not come over the supports.* Plank may be installed either side up. There are no joints to grout, forms to erect nor delays due to freezing weather.

The strength of a Gypsteel Plank roof, floor or partition is in the meshed steel binding. This binding forms a strong I-beam, stiffened laterally by the gypsum core. A facsimile copy of a report by the Civil Engineering Testing Laboratory of Columbia

Gypsteel Plank Applications (Continued)

University on a series of tests made upon Gypsteel Plank will be sent upon request.

Plank may overhang 6 in. at the end of building and, at the eaves, may overhang up to 18 in. Plank may be erected on any type roof. They may be placed either with or across slope. Built-up, shingle, copper, slate and other standard roofings are easily applied over Gypsteel Plank. They may be nailed directly to plank with square-cut nails. For heavy roofing and steep pitches, the roofing should be nailed to wood grounds attached direct to plank.



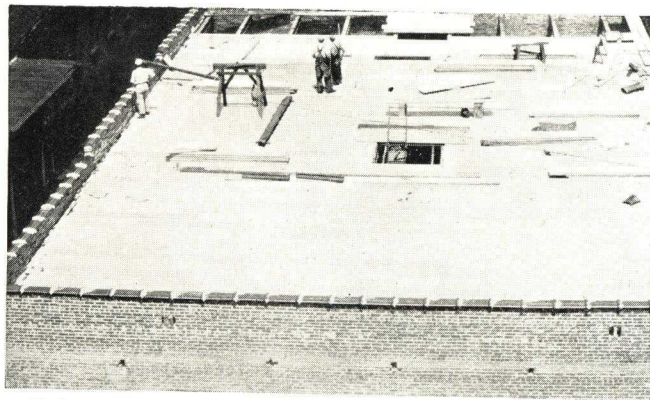
An Important Feature Is the *Tapered Steel Tongue and Groove* That Meshes Easily and Drives Up Tightly

Floor Construction

Used in the same manner as for roofs, on spans up to 5 ft. 0 in. in any type of light load building. Practically any type standard finish flooring may be directly applied to plank. Most reputable manufacturers of flooring have prepared detailed specifications for the application of their products over Gypsteel Plank and we refer you to their catalogs for complete information. Ordinary double floors are laid by simply nailing the rough flooring (cut nails are recommended) direct to the Gypsteel Plank, then laying the finished flooring in the usual manner. For terrazzo, cement or similar poured finishes, the plank should first be waterproofed with a coat of tar or asphalt or a layer of waterproof flooring, and the finish applied in accordance with the best practice as recommended by the Portland Cement Association and similar trade bodies.

Sheathing

Applied horizontally or vertically, with broken end joints, against the building frame. When used for sheathing the members may be spaced up to 7 ft. on centers. Exterior may be finished with clap-board or shingles, attached to grounds, nailed through and clinched on opposite side of plank. For stucco finish plank is prepared in same way as wood sheathing by first covering it with waterproof paper or waterproofing it by any standard method, after which ribbed metal lath is securely nailed in place.



End Joints Come at *Random*, Without Regard to Location of Supports

Furring

When Gypstel Plank is used for furring, the insulation of a wall is substantially increased. It contributes an important degree of fire safeness to wood frame buildings and makes them cooler in summer, as well as more easily heated, than when built of ordinary frame.

Partitions

Non-bearing partitions without studding are speedily built from Gypsteel Partition Plank. They provide an excellent surface for decoration, *even eliminating* the necessity for costly *plastering*. Plank are erected vertically from floor to ceiling either in one piece or with joints broken similar to the method followed in floor or roof construction.

GYPSTEEL PRE-CAST GYPSUM ROOFS

General—Two Types

There are two types of Gypsteel Pre-cast Roofs: namely, *Long Span Suspension Type* and *Short Span*. Both offer basic advantages of construction, economy, and upkeep, but each has distinguishing features that make it more adaptable to specific types of construction.

Gypsteel Long Span Suspension Type Pre-cast Roof—Is manufactured in long slabs which span the distance between and rest upon the top flanges of the main roof purlins, without the necessity of any secondary steel framing. Purlins may be spaced up to 7 ft. to suit the convenience of design.

Gypsteel Short Span Pre-cast Roof—Consists of slabs 30 in. in length, supported by subpurlins spanning the distance between the main purlins. For the greatest economy they should be installed upon the Gypsteel subpurlin especially developed for this purpose. They may also be supported by tees, angles, light rails, junior beams or metal joists.

Where Each Type is Used

Where the paneled ceiling made by the exposed bottom flanges of the Gypsteel subpurlins may not be acceptable, or where manufacturers' processes producing high temperatures and humidities may cause excessive condensation to form on the subpurlins, the Gypsteel *Suspension Type Long Span Roof* is offered. Its smooth ceiling formed by slabs passing entirely over the supporting steel, gives an unusually pleasing appearance and the highest possible insulation.

For curved surfaces, very irregular roofs, or those with numerous hips, valleys or dormers, the Gypsteel *Short Span Roof* is most adaptable.

Gypsteel Pre-cast Roofs are used for all types of industrial buildings, apartment houses, churches, clubs, garages, hospitals, hotels, office buildings, public buildings, schools, theatres and similar buildings.

Gypsteel Suspension Type Pre-cast Long Span Roofs

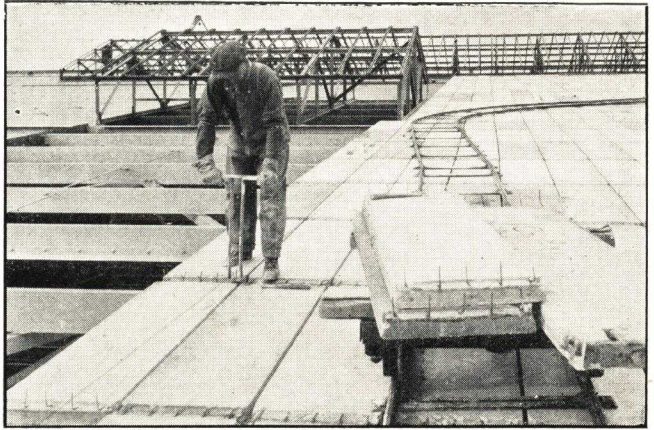
What They Are and How Installed

Gypsteel Suspension Type Pre-cast Roof Construction consists of closely spaced steel cables in deflection and tension, embedded in and entirely supporting pre-cast slabs of Gypsteel gypsum composition.

The phantom view shows cable ties, anchorage and grouted ends, side joints, anchor slots, cables in deflection and tension running through slabs, ends of cables tied together in the depression between the slabs.

The Gypsteel slabs are factory moulded in steel forms, in which the steel cables are held in uniform deflection and tension. Each cable emerges within $\frac{3}{4}$ in. of the top and projects $2\frac{1}{2}$ in. beyond the ends of the slab.

The slabs are laid from center to center of the main roof



Installation of Suspension Type Roof

Projecting cables are tied together, hammered down, and joints grouted purlins; abutting cables are twisted together and hammered down into the recesses. At the sides of the building they are securely anchored to the steel frame. All joints are grouted to form, in effect, a monolithic roof. As soon as grout has set, waterproofing may be applied. There is no waiting for the roof to dry out, or for forms to be stripped.

Gypsteel Suspension Type Pre-cast Roofs are suitable for all classes of roofs not excessively steep in pitch, and having rectangular areas.



Showing cable ties, anchorage and grouted ends, side joints, anchor slots, cables in deflection and tension running through slabs, ends of cables tied together and hammered down in depression between slabs

Gypsteel Pre-cast Short Span Roofs

What They Are and How Installed

Gypsteel Pre-cast Short Span Roofs consist of reinforced rectangular solid or hollow slabs of Gypsteel Composition manufactured in standard length of 30 in.

Solid slabs are 24 in. wide, the hollow 12 in., and come $2\frac{1}{2}$ or 3 in. thick, solid, and 3 or 4 in. thick hollow.

The slab in most general use is the 3 in. solid or hollow. Either type (or the 4 in. hollow) is installed between the Gypsteel Subpurlin (see below) spaced about $30\frac{3}{8}$ in. back to back.

These subpurlins span the distance between and rest upon the main purlins or trusses, to the top flanges of which they are either bolted, clipped or welded.

The $2\frac{1}{2}$ in. thick slab cannot be used with the Gypsteel sec-

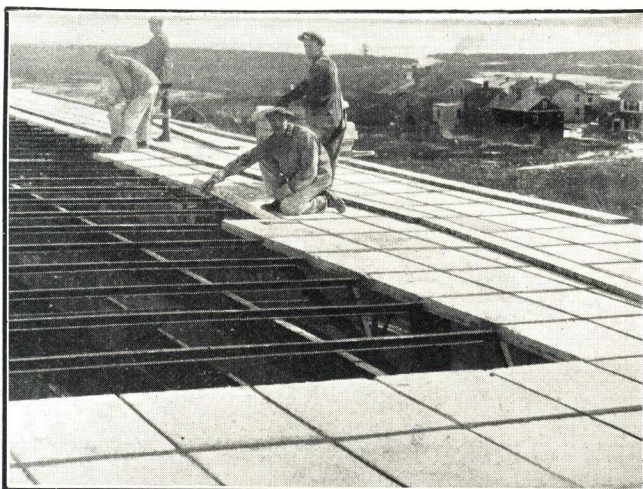
tion, as the latter would project above the top surface of the slab.

Light rail, tee, or angle subpurlins may also be used in a similar manner with all sizes of Gypsteel Short Span Slabs, or the slabs may rest directly upon the top flanges of Junior Beams or metal joists.

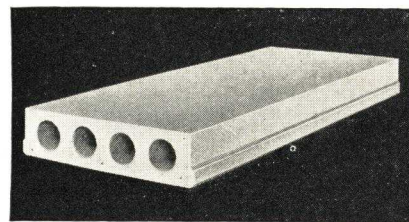
After erection the spaces between the side and ends of the slabs, and over the intervening subpurlins are solidly filled with gypsum grout leveled flush with the top surface of the slabs.

Short Span Roofs are particularly adaptable where the pitch is unusually steep or where the roof is cut up by hips, valleys, dormers, irregular openings and so forth.

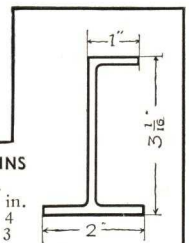
They are also very economical on the usual factory or flat pitched type of roof, particularly if the spans are over 7 ft.



Installation of Gypsteel Pre-cast Short Span Roof



3-in. Hollow Short Span Slab



ELEMENTS OF GYPSTEEL ROLLED STEEL SUBPURLINS

Weight per linear foot.....	2.64 lbs.
Area	.775 sq. in.
Moment of inertia.....	1.079 in. 4
Section modulus.....	.603 in. 3

TOTAL LOAD CARRYING CAPACITY IN POUNDS PER SQUARE FOOT

Span	Based on 30-in. spacing S = 18,000					
	Maximum deflection .268 in.					
	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"
Load, lbs. sq. ft.	115	95	80	68	59	51

WEIGHT TABLE

Gypsteel Gypsum Plank.....	11 lbs. per sq. ft.
Gypsteel Suspension Type Pre-cast Long Span Roof.....	14 lbs. per sq. ft.

Gypsteel Pre-cast Short Span Roof:

$2\frac{1}{2}$ in. solid.....	12 lbs. per sq. ft.
3 in. solid.....	14 lbs. per sq. ft.
3 in. hollow.....	11 lbs. per sq. ft.

UNITED STATES PIPE & FOUNDRY COMPANY

GENERAL OFFICES
BURLINGTON, N. J.

BIRMINGHAM, ALA., First Avenue and 20th Street
BUFFALO, N. Y., 957 E. Ferry Street
CHICAGO, ILL., 122 So. Michigan Boulevard
CLEVELAND, OHIO, 1150 E. 26th Street

SALES OFFICES
DALLAS, TEX., 108 So. Akard Street
KANSAS CITY, MO., 818 Bryant Building
LOS ANGELES, CALIF., 2326 E. 8th Street
MINNEAPOLIS, MINN., 6th Street and Hennepin Avenue

NEW YORK, N. Y., 71 Broadway
PHILADELPHIA, PA., Liberty-Lincoln Building
PITTSBURGH, PA., Koppers Building
SAN FRANCISCO, CALIF., 681 Market Street
SEATTLE, WASH., First and Marion Streets

Products

"USICAST": Cast Iron Plate Roofing.

CAST IRON PIPE: Bell and Spigot for water and gas mains and services, Flanged for steam and chemicals; CAST IRON FITTINGS; FERTILIZER MACHINERY including Exhausters and Mixers; SUGAR HOUSE MACHINERY.

Also manufacturers of Flexible Pipe Joints for submerged pipe lines; High Pressure Lug Pipe and Fittings

for fire protection lines; Plain End and Threaded Cast Iron Pipe; Cement Lined Pipe; Keystone Cast Iron Columns; Cast Iron Products, including Tanks and Coal Chutes; Chemical Apparatus, such as Acid Eggs, Evaporators, Retorts, Acid Valves, Nitre Jugs, Disintegrators, etc.; Large Iron Castings for all purposes made to purchasers' designs; Gas Producers.

"USICAST" ROOF—THE CAST IRON ROOF

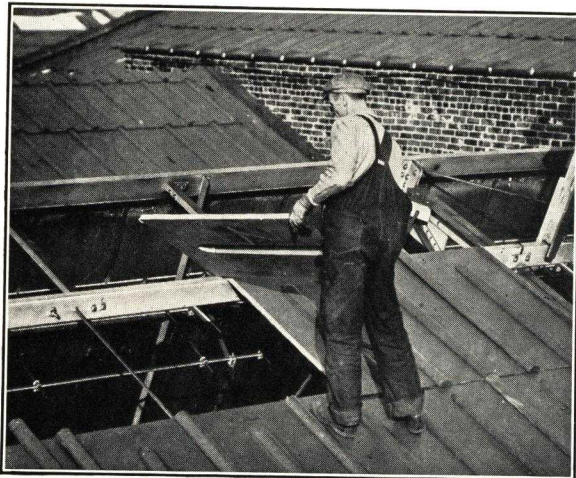
One of the most recent and outstanding developments in industrial building construction has been the development of the "Usicast" Roof. This roof is composed of cast iron plates, 24x52 ins., and weighing approximately seventy-eight pounds each. These plates are locked upon the roof structure by the use of a cap plate equipped with lug and notched key.

Illustration shows recent installation of "Usicast" Roof on a large industrial plant in New York Metropolitan District, where it was used to replace other material.

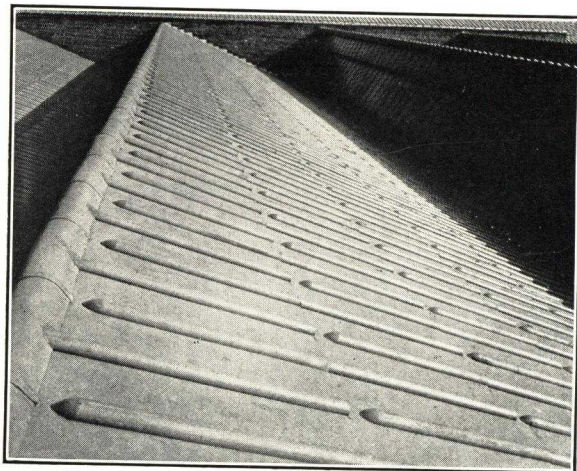
The outstanding advantages of the "Usicast" Roof are: long life, low maintenance cost, resistance to erosion and corrosion, ease of installation, etc. This roof will prove ideal for chemical plants, gas plants, oil refineries, foundries and general industrial structures.

Write for booklet describing in detail the "Usicast" Roof.

Our Engineering Department welcomes consultation with architects, engineers, etc., regarding new work or replacements.



"Usicast" Roof Plates Are Easily Installed



"Usicast" Roof in New York Metropolitan District

deLavaud Centrifugally Cast Iron Pipe

Cast iron pipe is inherently so satisfactory for underground work that it has been claimed that much improvement was impossible. However, by the utilization of centrifugal force in the manufacture of pipe, a method has been developed that produces pipe superior in many respects to pit cast pipe.

All things considered, it is evident that deLavaud centrifugally cast, cast iron pipe is an ideal material for many installations, and we believe that it is only a question of time before this material will revolutionize the use of pipe in industry.

Write for deLavaud Handbook.

Sugar House Castings

We now have arrangements for the exclusive manufacture and sale of the Webre Sugar Evaporator which is well known in the industry.

Our engineering department is fully competent not only to design such apparatus as may be required, but also to advise prospective customers as to the best solution of their problems.

Handbook of Cast Iron Pipe for All Services

A Handbook has recently been issued by the Cast Iron Pipe Research Association covering good engineering practice in laying cast iron pipe. This book also contains chapters on the usual problems confronting users of this material. We shall be glad to send a copy to any Engineer interested in piping. Write us for "Handbook of Cast Iron Pipe."

ESTABLISHED 1882

FLOCKHART FOUNDRY CO.

Engineers and Manufacturers of Standard Construction Castings

MAIN OFFICE

87 Polk Street, NEWARK, N. J.

Products

A complete line of CONSTRUCTION CASTINGS adapted for construction of highways, water works, storm and sanitary sewers, sewage disposal works, docks, gas and electric plants, etc. Castings are made of gray cast iron, guaranteed against breakage.

Engineering Service

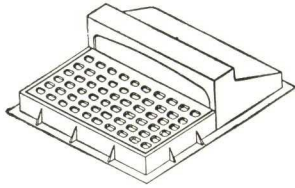
We maintain a specialized engineering service for

the solution of particular problems. Service is rendered without charge to engineers.

Data Sheets

Data sheets are issued for all our products. These show all detail dimensions and other necessary information for ordering and installing.

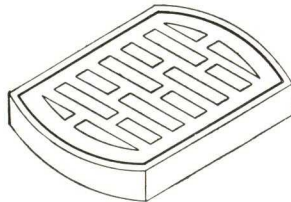
Write for them by number and description of product.



No. 25128

Large Curb Inlet

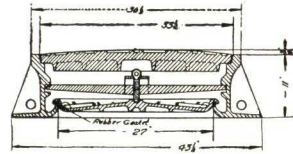
Strong design with heavily reinforced grating. Curb piece any height or radius. Grating, 48x22 in. Same type with grating 34½x21 and 29½x49 in.



No. 25477

Frame and Grating for Park Use

Size, 25x18 in. Depth, 2 in.



No. 26287

Waterproof Type of Manhole Frame and Cover

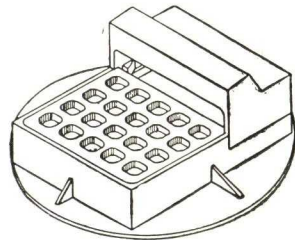
With rubber gasket and lock. Flange diameter, 46½ in. Minimum opening, 30 and 27 in. Also with high flange. Circular or square flange. Other openings 20½, 26½ and 38-in. diameter



No. 26560

Heavy Frame and Cover for Electrical Subways

Flange diameter, 43 in. Minimum opening, 24 in. Depth, 10 in. Also 27 and 30-in. diameter openings



No. 25263

Small Curb Inlet

Curb piece any height or radius. Grating, 22¾x19¼ in. Plane or concave grating



No. 25054

Ring and Cover

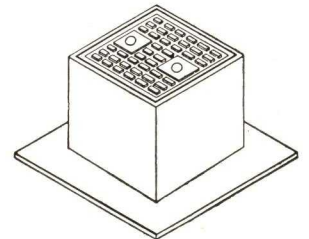
Diameter, 16, 18, 20, 22, 24, 30, 36 and 42 in. Made for light or heavy traffic. Adapted to concrete slab work



No. 25206

Heavy Manhole Frame and Cover

Flange diameter, 48¾ in. Minimum opening, 36 in. Depth, 8 in. Also with minimum opening of 24, 30 and 42 in. The 36 and 42-in. sizes made with double concentric covers



No. 25403

Heavy Monument Box or Protection for Water or Gas Line Valves

Flange, 17 in. square. Minimum opening, 8¾ in. Depth, 9 in. Also in light type

DATA SHEET NUMBERS

Classification	Max. opening, inches	Data sheet number
I Heavy frames and covers		
1. Circular—flange at bottom.....	48	158, 168
2. Circular—flange at top.....	48	159
3. Circular—sealed and locked.....	48	154, 194, 173, 201
4. Square.....	48	135, 169
5. Rectangular.....		135, 169
6. Square—sealed and locked.....		179
II Heavy frames and gratings		
1. Plane surface.....	48x35	187, 192, 135
2. Concave surface.....	28x48	163, 173, 135
III Light frames and covers		
1. Circular.....	48	156
2. Square.....	48	183, 142
3. Rectangular.....		195
IV Light frames and gratings.....		170
V Curb inlets (catchbasin heads).....		145
VI Catchbasin traps.....		146
VII Floor plates for light or heavy traffic, provided with angle seats; made also especially adapted for terrazzo and concrete fill.....		148
VIII Wheel guards, angles, etc., for building protection.....		186
IX Clean-out frames and doors.....		179
X Valves		
1. Flap.....		127
2. Lift.....		140
3. Shear.....		130
4. Slides.....		131
XI Mooring posts, bitts, chucks, cleats.....		171
XII Watertight heavy floor drains.....		199
XIII Leader Shoes.....		196

AMERICAN-MONINGER GREENHOUSE MFG. CORP.

Builders of Glass Enclosures for Sludge Drying and Trickling Filter Beds

1925 Flushing Avenue
BROOKLYN, N. Y.

124 Ketcham Avenue
AMITYVILLE, L. I., N. Y.

1313 West Randolph Street
CHICAGO, ILL.

2021 Gatewood Avenue
OKLAHOMA CITY, OKLA.

American-Moninger Glass Enclosures

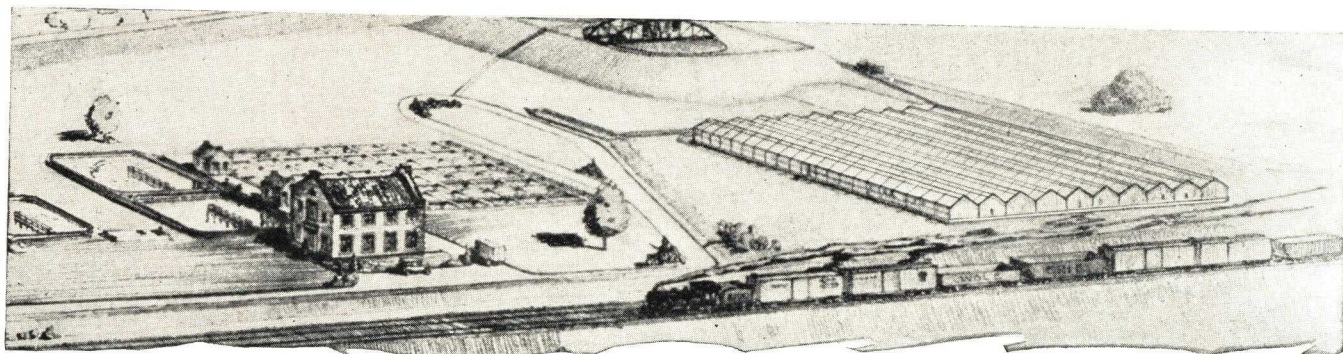
American-Moninger Glass Enclosures for sludge drying and trickling filter beds, employed as units of modern sewage disposal systems, add considerably to the economy, efficiency and attractiveness of the necessary equipment for such systems. These enclosures are designed strictly in accordance with the best engineering practice, great care being exercised in the scientific planning of even the most minute detail. None but the highest quality materials are used throughout the structure, which is fabricated, assembled and erected in a thoroughly workmanlike manner, well proven by many years of experience.

Standard Dimensions of Enclosures

Standard widths are 20, 25, 30, 35, 40, 50, 60, 70 and 80 ft. Intermediate widths are made to suit. Widths up to 40 ft. are well adapted to building in range form, employing American-Moninger patented galvanized-steel connecting gutter. Widths up to 50 ft. have no interior columns.

All roof ventilators are 29 in. deep, hinged to swing out. Side sash are 29 in., 35 in. or deeper, used in single or double rows, hinged to swing either out or in to suit.

Write for illustrated booklet giving complete data and details of design.



Sewage Disposal Plant, City of Lima, Ohio
H. P. JONES & Co., Toledo, Ohio, Engineer
GREEN & SAWYER Co., Lima, Ohio, General Contractor

Specifications for American-Moninger Glass Enclosures

Steelwork—Supporting framework consisting of trusses, ridge, purlins, columns, eaves and sill are made of open hearth steel of standard shapes only. Trusses are hot riveted as far as practicable at the factory, being in one piece in widths up to 40 ft. Columns are embedded well in the concrete and the entire structure bolted securely in field assembly, also being provided with proper sway bracing.

Woodwork—All woodwork entering into the construction will be clear, air dried gulf red cypress free from any injurious sap, knots or other defects, and machined to a smooth finish to correct pattern for purpose intended.

Ventilating Apparatus—Ventilating machines will be encased gear type with handwheels conveniently located for access from walks or doors. Shafting will be 1¼-in. standard wrought-steel pipe securely connected with malleable pinned couplings. Hangers will be roller bearing bolted to steel superstructure. Operators will be steel rack and pinion type, well made for easy opening, except for short runs where elbow arm type will be employed.

Glass and Glazing—All glass is double strength machine made, flat drawn, greenhouse grade, especially well adapted to sludge drying and trickling filter beds. Sizes are 16x24 in. and 16x30 in. for 29-in. and 35-in. sash, respectively, and 16x18 in. for balance of structure which insures a minimum of breakage—in no case are glazing bars spaced farther apart than for glass 16 in. wide. All glass is embedded in an elastic

glazing compound which does not harden, and secured by hot process galvanized brads which do not loosen by frost action.

Paint and Painting—The ridge, eave, gutter, sill and columns are all hot process galvanized, and all other steelwork is primed at the factory with a high quality rust inhibiting primer. (Optional, all steelwork to be galvanized.) All woodwork is painted at the factory with one coat of primer especially selected for cypress. The entire structure, except galvanized parts, receives two additional coats of acid and fungus resisting paint after erection, the final coat being applied after glazing so that all glass is neatly striped at the bars to cover the exposed putty.

Hardware, etc.—All butts for sash and doors are heavy wrought steel, hot galvanized with brass pins. Doors will be equipped with thumb latch and store door handle combined with three-tumbler mortise lock, all parts of which are galvanized or brass. All other hardware and fittings for sill, eave and gutter as well as bolts for same are galvanized. All nails and screws used in securing woodwork are also galvanized.

Final—All items not specifically mentioned but necessary to make a complete structure will be furnished of the same high quality as outlined above. Sincere and full co-operation will be given engineer and general contractor toward completing the structure of which all may be justly proud.

Below Is a List of Some Recent Installations

NAME OF PROJECT	SIZE OF GLASS ENCLOSURE	ENGINEER
State of New York, Westfield State Farm, Bedford Hills, N. Y.	One 22'-0" x 52'-0"	N. Y. Dept. of Pub. Wks., Div. of Engrg.
State of New York, Clinton Prison and Dannemora Hospital, Dannemora, N. Y.	One 82'-0" x 64'-0"	N. Y. Dept. of Pub. Wks., Div. of Engrg.
Highland Park, Ill., North Shore Sanit. Distr., John Oliver, Pres., Waukegan, Ill.	Two 25'-0" x 101'-0" (One 74'-0" x 125'-0") (One 74'-0" x 250'-0")	Pearse, Greenley and Hansen, Chicago, Ill.
City of Dunkirk, Dunkirk, N. Y.	Ten 20'-0" x 175'-0"	Frederick F. Wing, Buffalo, N. Y.
City of Lima, Lima, Ohio	One 59'-2" x 77'-6"	H. P. Jones & Co., Toledo, Ohio
City of Norwalk, Norwalk, Ohio	One 40'-0" x 59'-0"	G. E. Scott, Norwalk, Ohio; H. P. Jones & Co., Toledo, Ohio
Old Greenwich, Conn.	One 60'-0" x 186'-0"	Metcalf and Eddy, Boston, Mass.
City of Oneonta, Oneonta, N. Y.	One 26'-4" x 37'-10"	Clyde Potts, New York, N. Y.
State of New York, Medium Security Prison, Walkill, N. Y.	One 19'-2½" x 34'-4"	N. Y. Dept. of Pub. Wks., Div. of Engrg.
State of Connecticut, State Veterans' Hosp., Seaside Sanitarium, Waterford, Conn.	Two 40'-0" x 76'-0"	John F. Lynch, New Haven, Conn.
State of New York, Harlem Valley State Hosp., Wingdale, N. Y.		N. Y. Dept. of Pub. Wks., Div. of Engrg.

Designers, Manufacturers and Builders of Glass Enclosures Since 1869

THE FOLEY GREENHOUSE MFG. CO.

Designers, Manufacturers, Builders of Sludge Bed and Sprinkling Filter Glass Enclosures, Greenhouses and Conservatories

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(A Suburb of Chicago)

Products

GLASS ENCLOSURES for Sludge Drying Beds, Sprinkling Filters and similar uses in connection with sewage treatment plants. Send for "Commercial Catalogue."

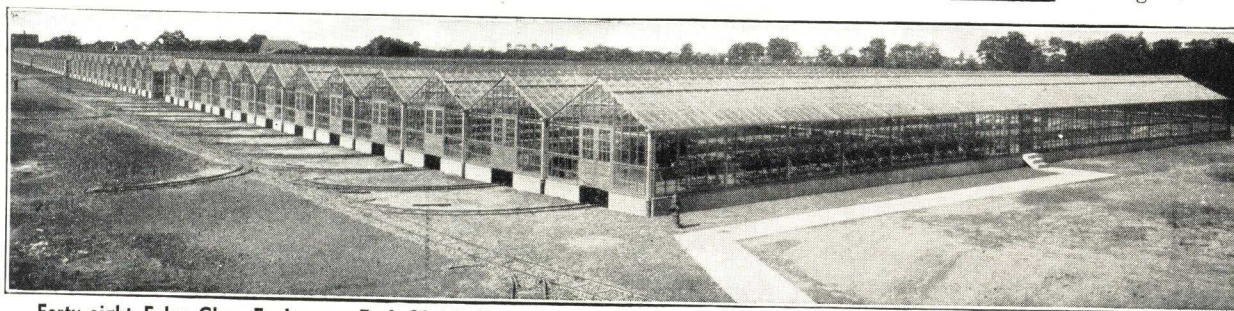
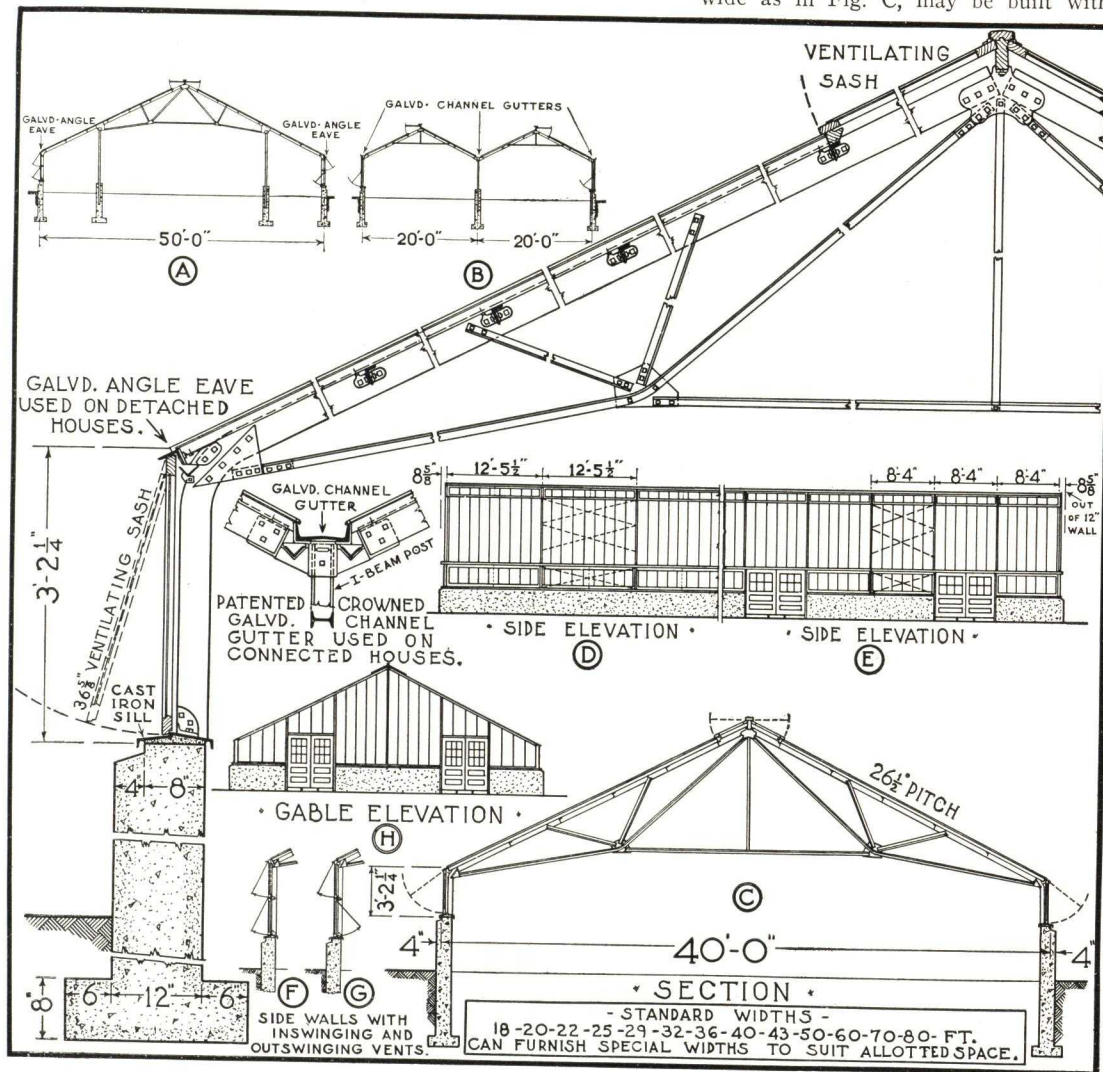
Also Greenhouses, Conservatories, Palm Houses, Solariums, Vitariums, Glass Enclosed Swimming Pools and Tennis Courts—including heating equipment and ventilating apparatus, boilers, propagating beds, plant benches, and tables. Send for book, "The Greenhouse Beautiful."

Service

We design, manufacture and erect. To engineers and contractors, we submit suggestions, data, estimates, sketches and specifications. Consult us before making final plans and writing specifications.

Designs—Plans adaptable to every size and type of glass enclosure are furnished. Fig. A shows a 50-ft. section with columns. Sections 20 ft. wide as in Fig. B and up to 40 ft. wide as in Fig. C, may be built without columns; however

columns may be used in any width of section. Trussed sections (without columns) are usually built in multiples of 8 ft. 4 in. units as in Fig. E (which also shows side doors for side industrial tracks). Sections with columns may be built either in multiples of 8 ft. 4 in. units as in Fig. E, or multiples of 12 ft. 5½ in. units as in Fig. D. Gable end, Fig. H, shows doors for end industrial tracks. The above units are standard construction. Special spacing may be had if necessary. Roof ventilators are always provided. Outswinging side ventilators as in Fig. F, or upper sash outswinging and lower sash inswinging as in Fig. G, or upper sash stationary and lower sash inswinging or outswinging as in Fig. B, or only outswinging as in Fig. C.



Forty-eight Foley Glass Enclosures, Each 20x160 Ft., Like Fig. B, Built at Bay View Park Sewage Treatment Works, Toledo, Ohio
H. P. JONES & Co., Engineers, Toledo, Ohio

INTERNATIONAL DERRICK & EQUIPMENT DIVISION

OF

INTERNATIONAL-STACEY CORPORATION

852 Michigan Avenue, COLUMBUS, OHIO

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CHICAGO

TULSA

DALLAS

HOUSTON

BEAUMONT

LOS ANGELES

For Other Products, see Manufacturers' Index under Roots-Connersville-Wilbraham Division

STANDARD STEEL BUILDINGS

The ready adaptability of standardized steel buildings to practically every form of industrial building requirement has caused thousands of them to be used by every branch of industry. As can be seen from this section of SWEET'S CATALOGUES, the general characteristics of

these buildings are quite similar. "Ideco" Standardized Steel Buildings not only incorporate all of the important features found in standardized steel building construction, *but also have six outstanding features that give increased value to you.*

Weather Tightness

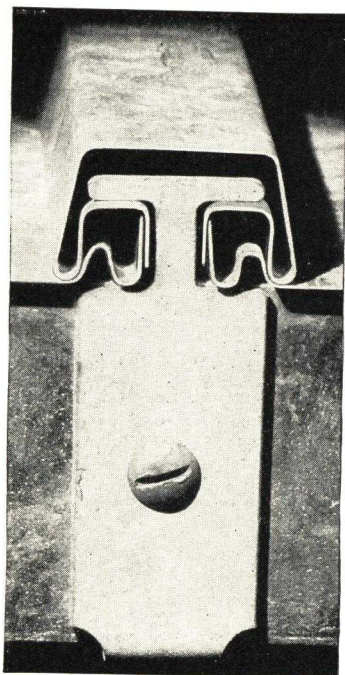
The use of the patented "Ideco" lockjoint sheeting and "Ideco" method of double flashing provides complete protection against rain, snow, wind and dust and makes possible the construction of a steel building *that is weather tight. No holes are punched in "Ideco" lockjoint roof sheets.*

Permanence

"Ideco" Buildings are the only buildings on the market having hot dip galvanized structural steel frames, sash and hardware in addition to the galvanized sheeting. This galvanizing adds permanence to "Ideco" buildings, lengthens their life and eliminates constant painting and other maintenance expense.

Strength

"Ideco" building frames are built of standard structural steel shapes, designed according to A.I.S.C. specifications. They do not depend upon sheet metal sidewalls and roofing or light pressed sections for strength. Nevertheless "Ideco" lockjoint sheeting is 28% stronger than standard corrugated sheeting and increases the strength of the building proportionately.



"Ideco" (Patented) Lockjoint for Roof and Sidewall Sheets

This lockjoint is absolutely weather tight, fastens the sheets securely, and eliminates capillary attraction of water

Ease of Erection

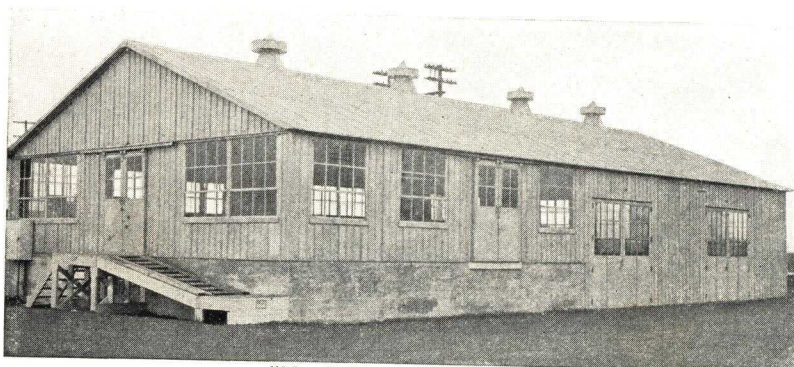
It does not take an expert to erect an "Ideco" building. The interchangeable sectional sidewall panel construction and simplicity of design makes erection a simple matter of raising the wall panels, bolting them to the foundations and adjoining panel, raising the roof trusses and purlins, attaching the roof sheets and applying the flashing, ventilators and other accessories. Alteration is a simple process and does not require the complete dismantling of the building. This is a tremendous advantage in planning for future requirements.

Habitable

The chief objection to steel buildings in the past has been the difficulty of keeping them comfortable in cold or hot weather. The "Ideco" (patented) method of insulation not only provides comfortable, easily heated buildings, but retains all of the economies and advantages of sectional steel construction. The insulated panels have a resistance to the transmission of heat or cold equivalent to 13 in. of brick or 20 in. of concrete, yet the cost of an "Ideco" insulated building is far below brick or masonry construction.

Attractiveness

The neat, well-groomed appearance of "Ideco" buildings with their good proportions, uniform ribbed sheeting and carefully designed trim, makes them acceptable in any surroundings.

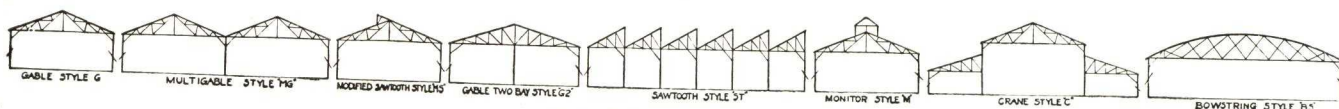


"Ideco" Warehouse Building

Styles and Sizes

"Ideco" buildings are made in eight different roof styles as shown below, and in a wide variety of sizes. They can be erected singly or in innumerable combinations to meet any specific requirements.

Send for our *Bulletin 200A* which describes in detail the superiority of "Ideco" Standard Building construction.



Eight Different Roof Styles

MARYLAND METAL BUILDING COMPANY

Clarkson, McComas, Donaldson and Race Streets
BALTIMORE, MD.

NEW YORK, N. Y.

CHICAGO, ILL.

PHILADELPHIA, PA.

RICHMOND, VA.

ATLANTA, GA.

Products

SECTIONAL METAL BUILDINGS of standard design or built to specifications to fill any industrial or commercial building need, providing perfect portability and the permanency of brick or concrete construction.

The MARYLAND INSULATED ROOF.

Maryland Metal Buildings

Use—

Maryland Metal Buildings are suitable for use as factory buildings, warehouses, freight stations, garages, pump houses, watchman's shelters, tool sheds, bunk houses, gasoline service stations, portable schoolhouses, plant hospitals or other similar adaptations. When built to specifications, Maryland Metal Buildings will answer any building demand.

Description—

The Maryland Metal Building is a structural steel building covered with standard interlocking sections of 24 gauge Lyonore Metal. Sheets are die stamped—corrugations semi-hexagonal in shape—and present a neat, attractive appearance and a rigid wall and roof construction capable of withstanding excessive loads.

Lyonore Metal is iron, alloyed with Chromium and Nickel. Each of the elements used in this extremely durable alloy is scientifically proportioned and combined to offer the greatest resistance possible to the corrosive action of the atmosphere.

Because of its great ability to resist corrosion, Lyonore Metal lasts several times longer than other similar sheet metals when exposed to the gases contained in the atmosphere surrounding industrial plants, mining districts, railroad centers or seaports.

The Maryland Metal Building can be erected by unskilled labor, easily dismantled and removed, increased or decreased in size and the salvage value is practically 100%.



The Maryland Metal Building, being absolutely lightning-proof, fire-proof and rust-resisting, will depreciate only slightly, even after many years' service.

Sizes—

Maryland Metal Buildings are carried in stock 6 to 60 ft. wide, clear span, in any lengths of 2-ft. multiples; 8, 10, or 12-ft. walls are standard heights. Can be furnished in special height walls, as desired.

Building Equipment—

Doors are of kalamein type (metal covered). Windows are standard steel bar sash, equipped with ventilators, glazed with 1/4-in. ribbed wire glass unless otherwise specified. All hardware is heavily galvanized—hinges fitted with bronze hinge pins.

As all units of Maryland Metal Buildings interlock, the use of bolts is reduced to an absolute minimum.

Maryland Insulated Roof

Easily and quickly installed—this roof consists of a deck of corrosion-resisting Lyonore Metal covered with an insulation that provides protection from heat and cold. Its covering of asphalt or slag assures a permanent, economical roof, increased working efficiency and offers complete protection from the effects of weather, fire and lightning.

Standard Steel Trusses

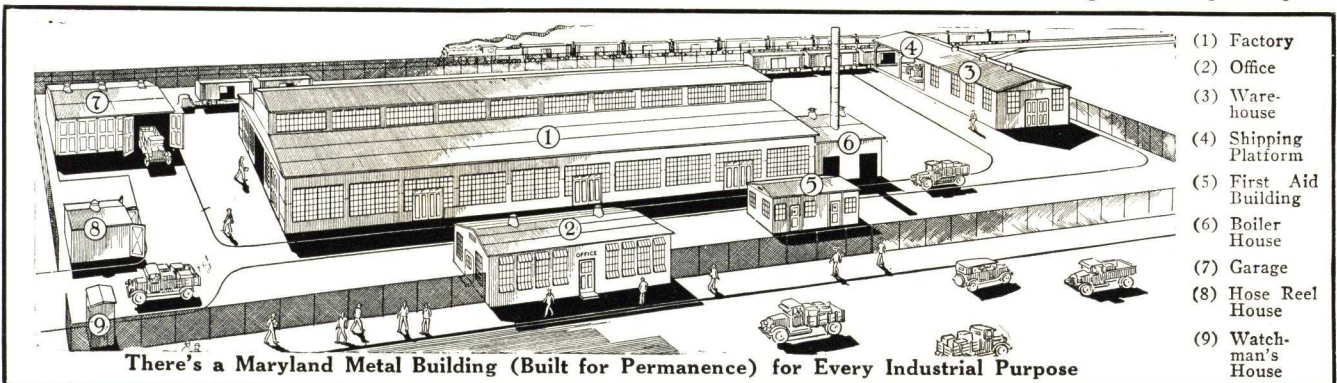
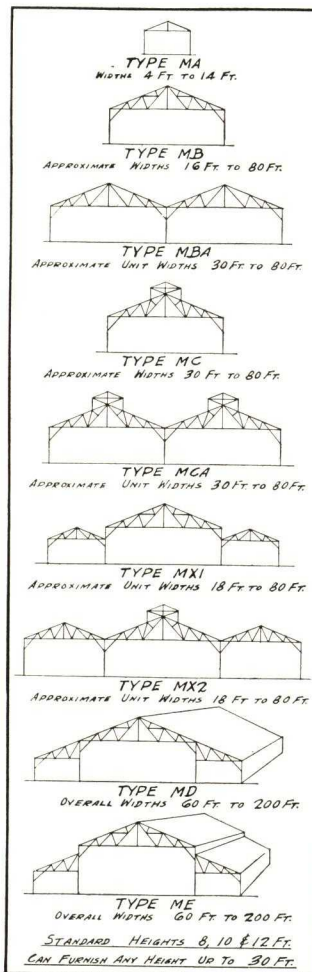
We are prepared to furnish entirely independent of our buildings, standard trusses in any span from 20 to 100 ft. arranged for either steel purlins, wood purlins or wood joists and designed to carry various roof loads.

Special Buildings

The MARYLAND METAL BUILDING COMPANY maintains a complete department for plant design and is able to furnish structures suitable for any particular manufacturing industry—monitor, lantern or sawtooth type of roofs.

Literature

"General Building Catalogue" or "Engineers and Architects Catalogue" sent upon request.



THE C. O. JELLIFF MFG. CORPORATION

Wire Cloth and Wire Work

200 Pequot Avenue, SOUTHPORT, CONN.

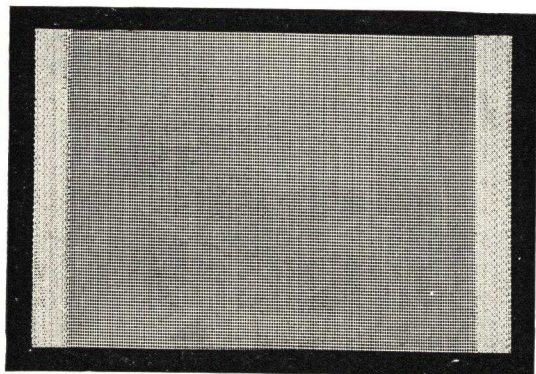
REPRESENTATIVES

BOSTON, MASS., Whitehead Metal Products Co., 67 Washington Street
 BUFFALO, N. Y., Whitehead Metal Products Co., 319 Niagara Street
 CHICAGO, ILL., Central Steel & Wire Co., 4545 S. Western Avenue
 DAYTON, OHIO, Central Steel & Wire Co., 1095 E. Monument Avenue

DETROIT, MICH., Central Steel & Wire Co., 5001 Bellevue Avenue
 NEWARK, N. J., Whitehead Metal Products Co., 215 Frelinghuysen Avenue
 NEW YORK, N. Y., Whitehead Metal Products Co., 304 Hudson Street
 SYRACUSE, N. Y., Chas. H. Meyn, 1834 W. Colvin Street

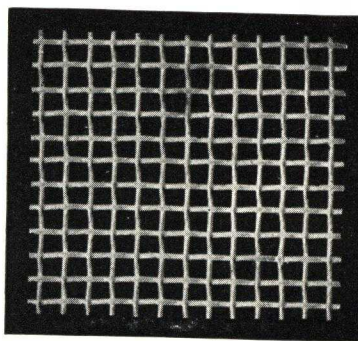
Products

WIRE CLOTH and WIRE WORK; Window, Elevator and Railing Guards; Heat Treating, Dipping and Conveying Baskets; Skylight Screens; Foundry Riddles; Sand, Gravel, Coal and Cinder Screens; Conductor Strainers; Sieves of all kinds.
 Complete catalogue sent on request.



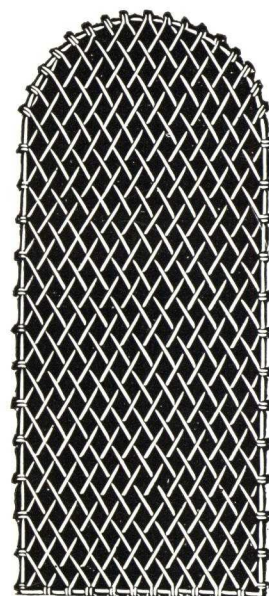
Wire Cloth with Rolled Selvage

Selvage insures mechanical precision in wire cloth. Eliminates raveled edges, broken and loose strands, uneven mesh. Applicable to practically all metals and meshes. Selvage from $\frac{1}{8}$ to $\frac{3}{8}$ in.



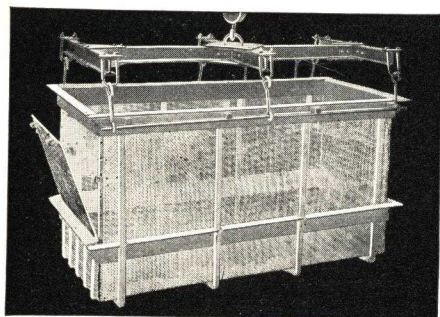
Wire Cloth

Furnished in all metals produced in wire form and in all known weaves. Stocks for immediate delivery; special jobs produced promptly.



Round Window Guard

Standard or special, built to specifications promptly, of finest quality weather resisting materials. Insures safety and protection.



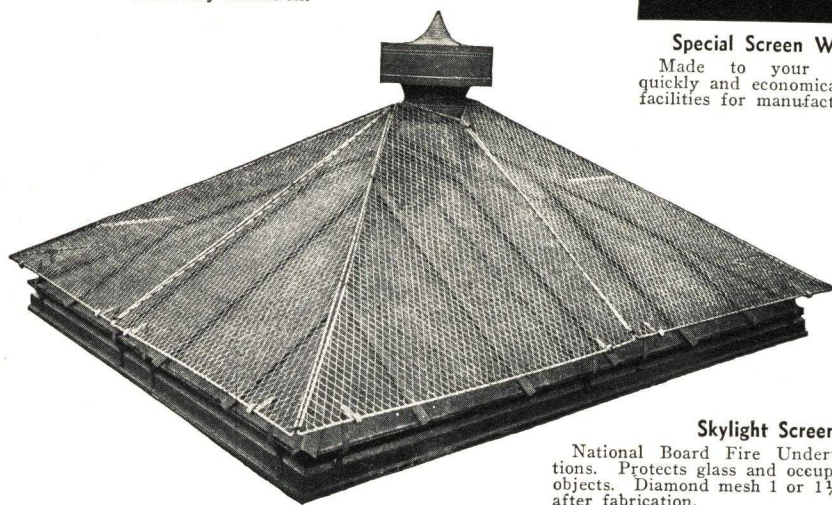
Heat Treating Baskets

Standard and special baskets in any alloy to meet any condition.



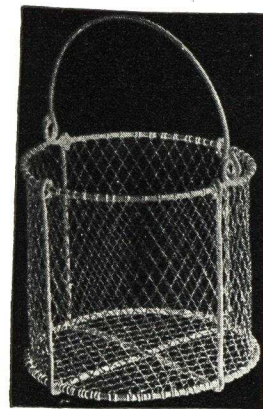
Special Screen Wire Parts

Made to your specifications quickly and economically. Special facilities for manufacturing.



Skylight Screen

National Board Fire Underwriters Specifications. Protects glass and occupants from falling objects. Diamond mesh 1 or $1\frac{1}{4}$ in. Galvanized after fabrication.



Dipping Basket

Design and metal suited to your requirements. Over fourteen standard designs. Will manufacture to your specifications or sketch.

PAGE FENCE ASSOCIATION

929 Connecticut Avenue, BRIDGEPORT, CONN.

MEMBER COMPANIES

From These Companies You Can Secure All Fence Products of the Page Steel and Wire Company, an Associate of the American Chain Company, Inc., Bridgeport, Connecticut

ALABAMA: BIRMINGHAM—Ingalls Iron Works
MOBILE—Turner Supply Co.
ARKANSAS: LITTLE ROCK—Arkansas Foundry Co.
CALIFORNIA: LOS ANGELES—Southern California Fence Co.
SAN FRANCISCO—Michel & Pfeffer Iron Works
COLORADO: DENVER—Stearns-Roger Mfg. Co.
CONNECTICUT: BRIDGEPORT—T. M. Barnes
NEW HAVEN—John P. Smith Co.
WESTPORT—Page Fence Exhibit
FLORIDA: JACKSONVILLE—J. G. Christopher Co.
MIAMI—E. F. Holmes
ORLANDO—Harry P. Leu, Inc.
GEORGIA: ALBANY—Albany Hdwe. & Mill Supply Co.
ATLANTA—M. L. Whitman
AUGUSTA—Barrett Supply Co.
COLUMBUS—Pekor Iron Works
MACON—Willingham Sash & Door Co.
SAVANNAH—Savannah Iron & Wire Works
IDAHO: BOISE—Consolidated Wagon & Machine Co.
ILLINOIS: CHICAGO—Chicago Fence & Equipment Co.
INDIANA: INDIANAPOLIS—Hoosier Fence Co.
IOWA: DES MOINES—Des Moines Steel Co.
KENTUCKY: LOUISVILLE—Equipment & Supply Co.
LOUISIANA: NEW ORLEANS—Orleans Steel Products Co.
SHREVEPORT—J. B. Beaird Corporation
MAINE: SOUTH PORTLAND—Bancroft & Martin Rolling Mills Co.
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CUMBERLAND—Young Sales & Engineering Co.
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MICHIGAN: DETROIT—Barnes Wire Fence Co.
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SAGINAW—Koehler Bros.
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MINNEAPOLIS—Crown Iron Works Co.
MISSISSIPPI: JACKSON—Mississippi Steel & Iron Co.
MISSOURI: KANSAS CITY—Kansas City Wire & Iron Works
ST. LOUIS—Sears & Piou, Inc.
NEBRASKA: OMAHA—Gate City Iron Works
NEW YORK: BINGHAMTON—C. Y. Cushman
BUFFALO—Buffalo Fence Construction Co.
FORT EDWARD—Newton & Hill
NEW YORK—Brook Iron Works, Inc.
IN CANADA: NIAGARA FALLS, ONTARIO—Dominion Chain Company, Limited
NEW YORK: ROCHESTER—National Fence Co.
TROY—Fred K. Blanchard, Inc.
WATERTOWN—Thomas H. Bradley
NORTH CAROLINA: CHARLOTTE—Allison Fence Co.
WILMINGTON—Gregg Bros.
OHIO: CINCINNATI—The Davis & Siehl Co.
CLEVELAND—The Betz-Pierce Co.
COLUMBUS—Henry P. Howe Company
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WASHINGTON C. H.—W. W. Wilson & Son
ZANESVILLE—Wilking Hardware Co.
OKLAHOMA: OKLAHOMA CITY—Improved Sprinkler & Fence Co.
TULSA—The Peerless Supply Company
OREGON: MEDFORD—Volney Dixon
PORTLAND—Portland Wire & Iron Works
PENNSYLVANIA: ERIE—Erie Concrete & Steel Supply Co.
PHILADELPHIA—Horace T. Potts Co.
PITTSBURGH—Stewart-Holland Co.
SCRANTON—The Bittenbender Co.
RHODE ISLAND: PROVIDENCE—Rayhill & Greene Supply Co.
SOUTH CAROLINA: CHARLESTON—The Bailey-Lebby Company
TENNESSEE: CHATTANOOGA—James Supply Co.
JOHNSON CITY—Johnson City Foundry & Machine Co.
KNOXVILLE—S. T. Weaver Co.
MEMPHIS—C. R. Cochran
NASHVILLE—John Bouchard & Sons Co.
TEXAS: DALLAS—Dallas Belting Co.
EL PASO—Neff-Stiles Co.
FORT WORTH—Fort Worth Structural Steel Co.
HOUSTON—Everett Building Products Co.
SAN ANTONIO—Southern Steel Co.
UTAH: SALT LAKE CITY—Consolidated Wagon & Machine Co.
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WHEELING—Wheeling Structural Steel Co.
WISCONSIN: MILWAUKEE—A. F. Wagner Architectural Iron Works

Products

PAGE CHAIN LINK FENCING in three different metals to resist the varying atmospheric conditions in different localities:
(1) Alcoa Aluminum Fabric; (2) Armco Ingot Iron Fabric;
(3) Page Copper-bearing Steel.

PAGE ORNAMENTAL REFINED WROUGHT IRON (not steel) FENCING. Page Panel Partitions.

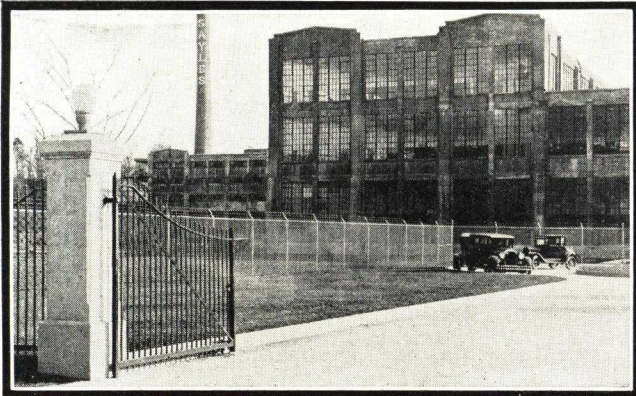
Service

The above companies carry stocks of Page Products and specialize in fence construction.

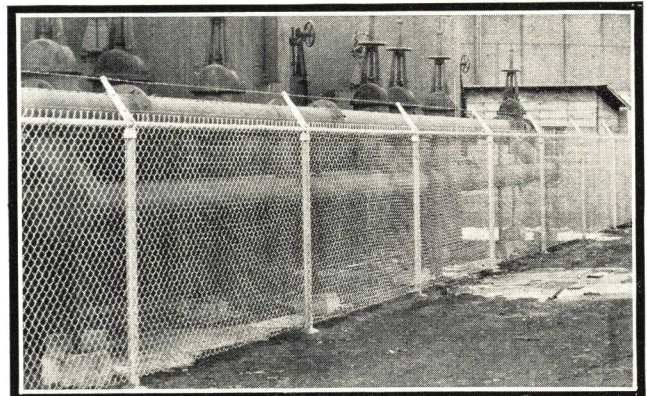
Estimates and recommendations gladly furnished.

Write for complete catalog.

Communicate with distributor nearest you or direct to PAGE FENCE ASSOCIATION, Bridgeport, Conn.



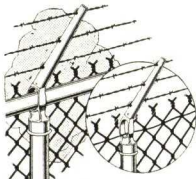
The Combination of Page Chain Link Fence and Page Wrought Iron Fence Greatly Enhances the Appearance of Industrial Property



For the Heavier Type of Fence Construction, Page H-Beam Line Posts Represent the Maximum in Strength and Everlasting Service



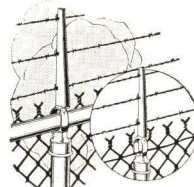
OTR Without Barbed Wire with Top Rail
OW Without Barbed Wire or Top Rail



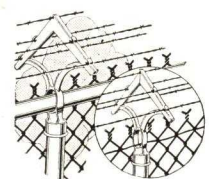
3TR 3 Strands Barbed Wire with Top Rail
3W 3 Strands Barbed Wire without Top Rail



3TR-LF 3 Strands Barbed Wire for Lighting Fixture



3TR-V 3 Strands Barbed Wire on Vertical Arm with Top Rail
3W-V 3 Strands Barbed Wire on Vertical Arm without Top Rail



5TR 5 Strands Barbed Wire with Top Rail
5W 5 Strands Barbed Wire without Top Rail

CYCLONE FENCE COMPANY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

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NORTH CHICAGO, ILL.
GREENSBURG, IND.

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PROVIDENCE, R. I.
ST. LOUIS, MO.
SHREVEPORT, LA.
TULSA, OKLA.
WASHINGTON, D. C.

PACIFIC COAST DIVISION: Standard Fence Company, OAKLAND, LOS ANGELES, SAN FRANCISCO, CALIF., PORTLAND, ORE., SEATTLE, WASH.

Cyclone Invincible Chain Link Fence



Cyclone is not a "type" of fence but fence made exclusively by CYCLONE FENCE COMPANY and identified by the trade-mark

Standard height, 7 ft. Built in heights up to and including 12 ft. In all heights, Chain Link fabric is 1 ft. less than complete height of fence.

Fabric—"Galv-After" Chain Link copper steel wire, heavily zinc-coated (or hot-galvanized) by hot-dip process after weaving. No. 9 or No. 6 gauge wire woven in a 2-in. mesh. On heights 5 ft. and over, both edges of fabric have a twisted and barbed finish. On special heights, 4 ft. and lower, one edge has twisted and barbed finish; the other has knuckled finish.

Posts—Line Posts—Hot-dip galvanized; 2-in. H-column, copper-steel. Weight 4.10 lb. per lin. ft.

End, Corner, Angle and Pull Posts—3-in. outside diameter standard full weight tubular copper-steel. Weight 5.79 lb. per lin. ft.

Swing Gate Posts—3-in. outside diameter, weight 5.79 lb. per lin. ft. for single swing gates up to and including 6-ft. opening and for double swing gates up to and including 12-ft. opening.

4-in. outside diameter, weight 9.1 lb. per lin. ft. for single swing gates wider than 6 ft. and up to and including 13-ft. opening; also for double swing gates wider than 12-ft. opening and up to and including 26-ft. opening.

6 $\frac{3}{8}$ -in. outside diameter, weight 18.97 lb. per lin. ft. for single swing gates wider than 13-ft. opening up to and including 18-ft. opening; also for double swing gates wider than 26-ft. opening and up to and including 36-ft. opening.

8 $\frac{1}{2}$ -in. outside diameter, weight 25 lb. per lin. ft. for single swing gates wider than 18-ft. opening and for double swing gates wider than 36-ft. opening.

Slide Gate Posts—4-in. outside diameter, weight 9.1 lb. per lin. ft. for all slide gates up to 30-ft. opening.

6 $\frac{3}{8}$ -in. outside diameter, weight 18.97 lb. per lin. ft. for all slide gates wider than 30-ft. opening.

Post Spacing—Posts are spaced in line of fence not farther apart than 10-ft. centers.

Post Setting—All posts are set 36 in. in concrete base of proper size and shape to furnish sufficient foundation.

Extension Arms—Hot-dip galvanized. All intermediate posts fitted with Cyclone Invincible Extension Arms of pressed copper-steel. End and corner posts are fitted with heavy malleable iron arms. Each arm carries 3 barbed wires securely fastened. Topmost barbed wire 12 in. above the fabric and 12 in. in or out from the fence line at an angle of 45°.

Top Rail—Made by the National scale-free process. Hot-dip galvanized. Tubular copper-steel 1 $\frac{1}{2}$ -in. outside diameter,



weight 2.27 lb. per lin. ft. Provided with expansion rail coupling. Top rail passes through base of extension arm and forms a continuous brace from end to end of each stretch of fence. Top rail is securely fastened to end, gate and corner posts by malleable iron or pressed steel connections.

Braces—Made by the National scale-free process. Hot-dip galvanized. End, gate and corner posts in fence 6 ft. or over in height are suitably braced by tubular copper-steel braces 1 $\frac{1}{2}$ -in. outside diameter, weight 2.27 lb. per lin. ft. Braces are spaced midway between top rail and ground and extend to the first line post. Braces are securely fastened to posts by malleable iron or pressed steel connections, then trussed from line post back to end, gate or corner post.

Fittings—Hot-dip galvanized. All fittings are malleable wrought iron, pressed steel or aluminum.

Barbed Wire—Hot-dip galvanized. Of four-point pattern, composed of two strands of No. 12 $\frac{1}{2}$ gauge copper-steel wire with large barbs placed 3 in. apart.

Fabric Bands—Aluminum. Fasten the fabric to line posts and top rail.

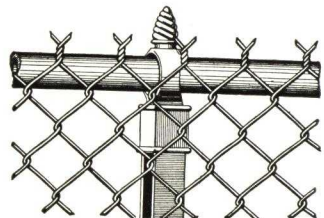
Finish—All materials entering into the fence construction, except aluminum bands, are heavily galvanized.



Top Finish of Invincible Fence

Cyclone Safeguard Chain Link Fence

Specifications—Standard height, 6 ft. Built in heights from 4 ft. up to and including 10 ft. Chain Link fabric is full height of fence. Same construction as Cyclone Invincible Chain Link Fence, except top finish. On heights 4 ft. and lower, one edge has twisted and barbed finish, the other has knuckled finish. The knuckled edge should be placed at top of fence dressed below top rail with the barbed edge at the bottom.

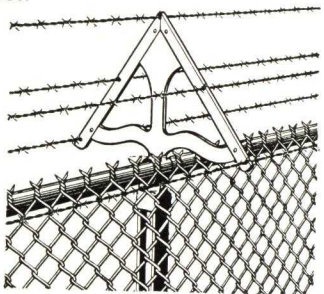


Top Finish of Safeguard Fence

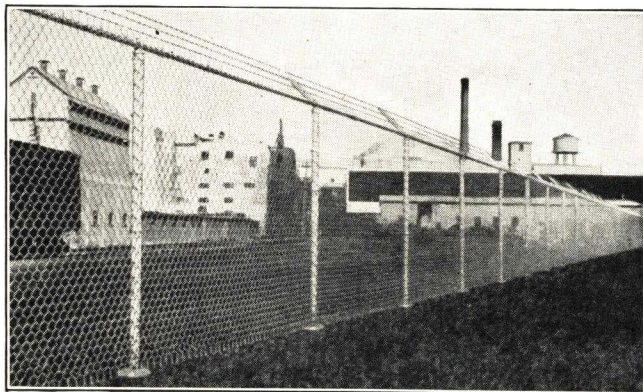
Cyclone Non-climbable Chain Link Fence

Specifications—Standard height 7 ft. Built in heights up to and including 11 ft. In all heights, Chain Link fabric is 1 ft. less than complete height of fence.

Construction same as Invincible Chain Link Fence, except top finish. All intermediate posts are fitted with non-climbable extension arms made of pressed copper-steel securely riveted to heavy malleable iron base. All end and corner posts are fitted with heavy malleable iron arms. These arms carry 5 strands of barbed wire, the topmost barb approximately 12 in. above top rail. Bottom barb wires overhang 9 $\frac{1}{2}$ in. each way from center.



Top Finish of Non-climbable Fence



Cyclone Invincible Chain Link Fence

Specifications, Cyclone Swinging Gates

Standard Sizes—Single swinging walk gates built standard for 4-ft. opening. Double swinging gates for driveways built standard for 12, 14 and 18-ft. openings. The standard size for railroad entrance is 18 ft. Where conditions are such that standard sizes can not be used, gates are built to meet requirements.

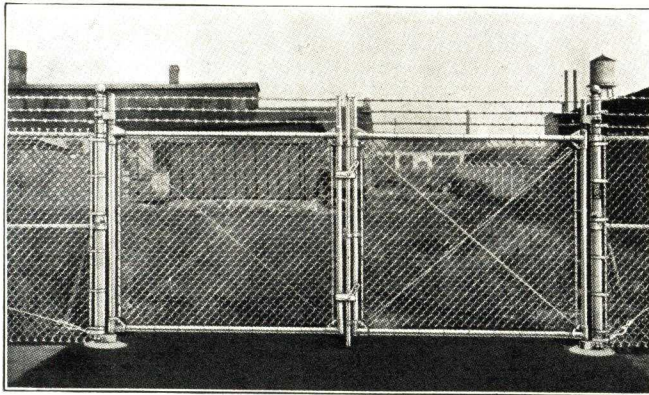
Frames—Hot-dip galvanized, tubular copper-steel. On fence having barbed wire top, the end members extend 1 ft. above top horizontal rail, and carry 3 strands of barbed wire.

Stays—Hot-dip galvanized, tubular copper-steel. Stays, together with $\frac{3}{8}$ -in. adjustable truss rods, keep gate absolutely rigid; prevent sagging or buckling.

Fabric—Cyclone "Galv-After" Chain Link to match fabric used in fence furnished.

Hinges—Hot-dip galvanized. Made of malleable iron. Exceptionally large bearing surface for clamping hinge on gate post. Cyclone swinging gate hinge equipment will carry 100% overload. Bottom hinge is ball and socket pivot type.

Latch and Lock—Hot-dip galvanized. On swinging gates of all types, latch is of the plunger bar type, arranged for padlock locking. Railroad and drive gates are equipped with catch posts to hold gates in open position.



Cyclone Swing Gates

Either single or double, for Invincible, Non-climbable or Safeguard Fence

Specifications, Cyclone Sliding Gates

Standard Widths—14 to 20-ft. opening for driveway. Standard overhead clearance 12 and 22 ft.

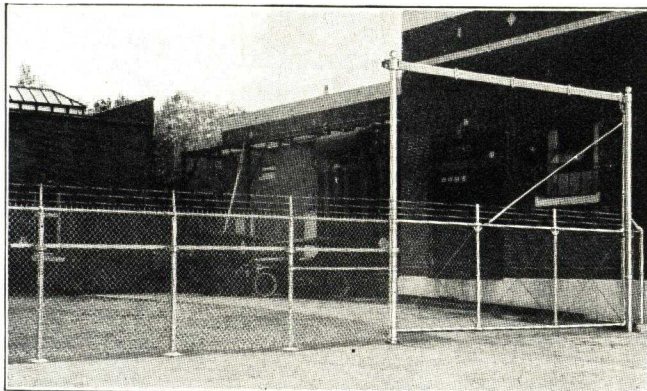
Frames—Hot-dip galvanized, tubular copper-steel. 2-in. outside diameter. When used with fence having barbed wire top, 3 strands of barbed wire are carried above the top horizontal rail.

Stays—Hot-dip galvanized, tubular copper-steel. Gate stays, together with $\frac{3}{8}$ -in. adjustable truss rods, keep gate absolutely rigid, prevent sagging and buckling.

Fabric—"Galv-After" Chain Link copper-steel wire to match fabric used in fence furnished.

Overhead Track Support—5-in. channel, weight $6\frac{1}{2}$ lb. per lin. ft. Fastened to gate posts by means of combination special ornamental ball post top cap and channel support.

Trolley—Double truck roller bearing type. Very easy to operate. Track completely enclosed.



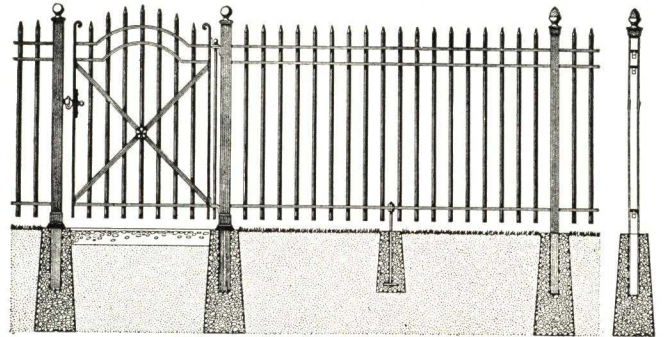
Cyclone Sliding Gates

Either single or double, for Invincible, Non-climbable or Safeguard Fence

Cyclone Wrought Iron Fence

Cyclone Wrought Iron Fence is built in any height and of any size materials. Blue prints and specifications furnished on request.

Wrought iron gates are built in any height and width of any size materials. Blue prints and specifications furnished on request.



Cyclone Wrought Iron Fence

Cyclone Wrought Iron Fence and Gates built in special designs from architects' drawings when desired

Complete Responsibility—Nation-wide Fencing Service

From the time your order is placed until fence is erected, this company assumes complete responsibility for every detail in the manufacture and installation of Cyclone Fence.

The CYCLONE FENCE COMPANY controls the quality of its product from the ore at the mine to the finished job. The highest grade materials especially suited to each purpose are selected for use in Cyclone Fence.

Furthermore, Cyclone Engineers design and specify fencing best suited to customers' requirements; then carry out the work of construction to the erection of the fence complete.

Engineering Counsel—Cyclone Engineers take an active part in planning your fencing. They will make a complete study of your fence requirements; submit estimate of cost; solve problems of adjusting fence to irregular property lines; of placing fence along embankments, grades, etc.; assist in locating; also in selecting the correct type of gates for driveways and walks.

Cyclone Erection Crews—There are adequate erection crews constantly at work installing Cyclone Fence. One of these crews is available for your installation and will handle the work quickly, correctly and economically. We erect fence anywhere.

However, if you prefer to have your own workmen install the fence, a Cyclone erection superintendent will be furnished at nominal charge, to direct them.

Diagram, Prices, etc.—When writing for information, prices, etc., send simple diagram or layout of proposed fencing. Give measurements of each stretch and total measurements. Indicate end, corner and gate posts thus, "O." State whether single or double swing, or sliding gates are wanted and give size of opening. Write for catalog No. 105.

Note: All weights and dimensions are nominal and are taken from full standard weight schedule adopted by manufacturers. The permissible variation in specifications is 5% either way.

Other Cyclone Products

We also manufacture Cyclone Chain Link Road Guard for highway danger points; Cyclone Chain Link Conveyor Belting; Cyclone Woven Wire Diamond Mesh Partitions; Cyclone Window Guards.

PITTSBURGH STEEL COMPANY

Manufacturers of Pittsburgh Chain Link and Other Pittsburgh Fences

GENERAL OFFICES

Union Trust Building, PITTSBURGH, PA.

DISTRICT SALES OFFICES IN PRINCIPAL CITIES

Pittsburgh Chain Link Fences

Pittsburgh Chain Link Fences are made to a standard of quality which is the result of more than twenty-five years' experience on the part of our Engineering and Production Departments in the manufacture and development of wire products.

We control every step in the manufacture of Pittsburgh Chain Link Fence from the ore to the finished product, and thus not only maintain uniform high quality but can sell this high grade product at no premium over other chain link fences.

All Pittsburgh Chain Link Fabric is made of the finest



copper-bearing basic open hearth steel, fabricated by the most modern equipment and hot zinc coated after weaving with a smooth, extra-heavy and well-bonded coating of pure zinc.

Other Pittsburgh Fences

In addition to the Chain Link styles, we manufacture a variety of other types of wire fences for Industrial, Home, Farm and Miscellaneous uses. All Pittsburgh Fences are copper-bearing and heavily hot zinc coated. Write our Pittsburgh office for further information and catalogues.

SPECIFICATIONS

Pittsburgh Custodian Chain Link Fence (Standard Heavy Construction)

Standard height, 7 ft. overall. Built in heights from 6 ft. up to and including 12 ft. In all heights chain link fabric is 1 ft. less than overall height of fence.

Fabric—Pittsburgh Chain Link copper-bearing basic open hearth steel wire, hot galvanized after weaving with heavy zinc coating. No. 6 or No. 9 gauge wire woven in 2-in. mesh. Selvage: both edges have a twisted and barbed finish.

Line Posts— $2\frac{1}{4}$ -in. H-section, weight 4.10 lb. per ft., or $2\frac{1}{2}$ -in. outside diameter seamless steel pipe, weight 3.652 lb. per ft.

Top Rail— $1\frac{1}{8}$ -in. outside diameter seamless steel pipe, weight 2.272 lb. per ft. Top rail may be omitted.

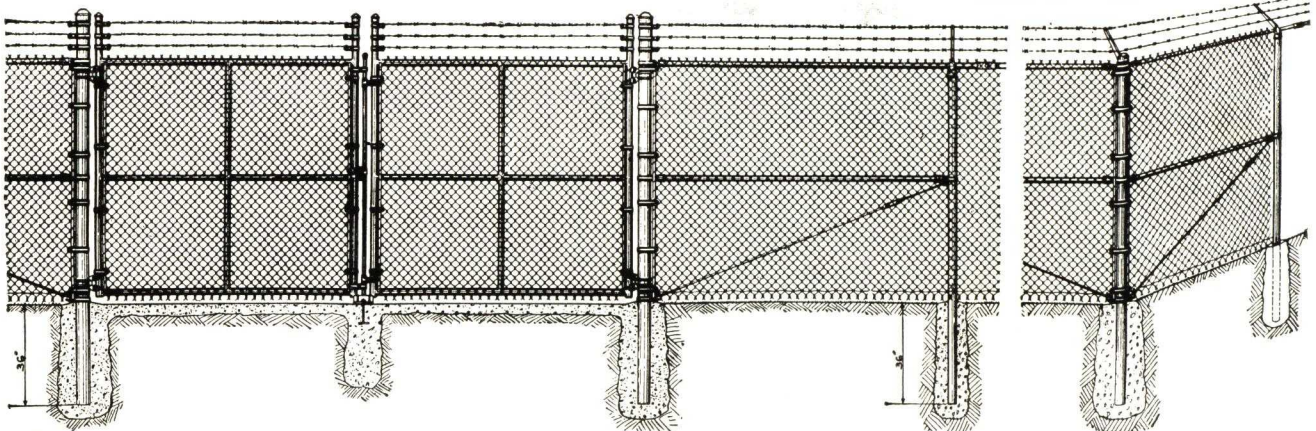
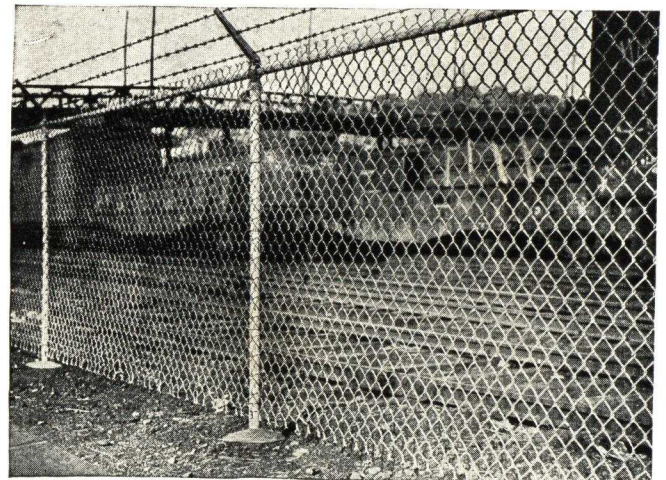
Terminal Posts—End and corner posts 3-in. outside diameter seamless steel pipe, weight 5.79 lb. per ft.

Swing Gate Posts—3-in. outside diameter seamless steel pipe, weight 5.79 lb. per ft. for single swing gates up to and including 6-ft. opening, and for double swing gates up to and including 12-ft. opening.

4-in. outside diameter seamless steel pipe, weight 9.10 lb. per ft. for single swing gates wider than 6 ft., up to and including 13-ft. opening. Also, for double swing gates wider than 12-ft. opening up to and including 26-ft. opening.

$6\frac{1}{8}$ -in. outside diameter seamless steel pipe, weight 18.97 lb. per ft. for single swing gates wider than 13-ft. up to and including 18-ft. opening. Also, for double swing gates wider than 26-ft. opening up to and including 36-ft. opening.

$8\frac{1}{8}$ -in. outside diameter seamless steel pipe, weight 24.7 lb. per ft. for single swing gates wider than 18-ft. opening, and for double swing gates wider than 36-ft. opening.



of 45 degrees, 12-in. in or out of the fence line; or the arm may be adjusted to vertical position if desired.

Barbed Wire—Four-point pattern, comprising two strands of 12½ gauge copper-bearing wire—heavily hot galvanized, with aluminum alloy barbs spaced 4 in. apart.

Post Tops—Made of heavily hot zinc coated malleable iron, designed to fit over post top to exclude moisture.

Tension Bars—¾x¼-in. tension bars, secured to terminal post with bands. Hot zinc coated.

Brace and Tension Bands—Made of heavy stampings of the latest approved type, hot zinc coated.

Fabric Bands—No. 6 gauge aluminum alloy of new improved self-tying design, eliminating unsightly buckles.

Gates—Frames made of 2-in. outside diameter hot zinc coated copper-bearing seamless steel pipe, weight 2.717 lb. per ft., with necessary intermediate braces of 1½-in. outside diameter copper-bearing seamless steel pipe, weight 2.272 lb. per ft.

Gate Filler—All gates to be filled with fabric to match fence line.

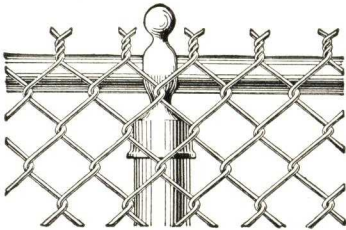
Hinges—Latest type improved heavy duty ball-and-socket design, permitting 180° gate swing, centering gate weight at ground line, eliminating gate sag and preventing turning of hinges on posts.

Latches—Heavy duty plunger-bar clevis type, designed for positive padlock locking.

Pittsburgh Guardian Chain Link Fence

(Standard Heavy Construction)

Standard height, 6-ft. Built in heights from 5 ft. up to and including 12 ft. In all heights chain link fabric is full height of fence.



Construction throughout is the same as Pittsburgh Custodian Chain Link Fence, except that there are no barbed wires or barbed wire extension arms at the top, and in the 5-ft. height of fence the line posts may be set 30-in. deep.

Pittsburgh Chieftain Chain Link Fence



Standard height, 7 ft. Built in heights from 7 ft. up to and including 12 ft. In all heights chain link fabric is 1 ft. less than overall height of fence.

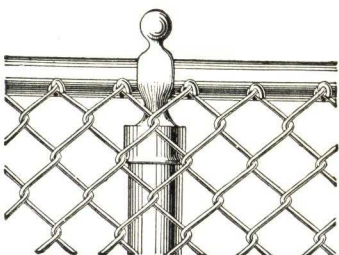
Construction throughout is the same as Pittsburgh Custodian Chain Link Fence, except top finish, which comprises 5 strands of barbed wire and barbed wire extension arms as illustrated here.

Pittsburgh Residential Chain Link Fence

Standard height, 4 ft. Built in heights 3, 3½, and 4 ft. In all heights chain link fabric is full height of fence.

Construction same as Pittsburgh Custodian Chain Link Fence shown on the previous page, omitting barbed wire tops, and with the following exceptions:

Fabric—Pittsburgh Chain Link copper-bearing basic open hearth steel wire, hot galvanized after weaving with heavy zinc coating. Furnished regularly in 2-in. mesh, No. 9 gauge. Also available in No. 6 gauge or No. 11 gauge. Selvage: one edge finished in barbed and twisted, other edge in knuckled finish. Recommended practice is to dress knuckled edge at top of fence just under top rail as illustrated.



Line Posts—2-in. outside diameter seamless steel pipe, copper-bearing, weight 2.717 lb. per ft.

Terminal Posts—End and corner posts 2½-in. outside diameter seamless steel pipe, weight 3.652 lb. per ft.

Gate Posts—2½-in. outside diameter seamless steel pipe, weight 3.652 lb. per ft. No bracing is required because of top rail.

Post Setting—Line posts are set 24-in. and terminal posts 30-in. deep in reinforced concrete footings (1:2:4 mix), crowned to shed water and protect post at ground line.

Gates—Residential gate frames are made of 1½-in. outside diameter seamless steel pipe, weight 2.272 lb. per ft.

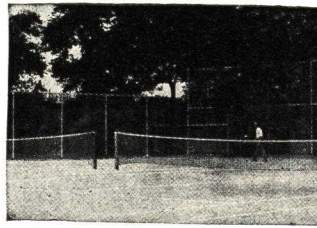
Pittsburgh Chain Link Tennis Court Fence

Heights—8, 10 and 12-ft. in one width of fabric. Heights greater than 12 ft. furnished in two panels.

Fabric—No. 11 gauge, 1¼-in. mesh; selvage knuckled top and bottom.

Posts and Framework—Same as for Custodian Fence.

Gates—Standard Tennis Court Gates are 7-ft. high by 3½-ft. opening (walk); or 10-ft. opening (double drive) with overhead transom. This fence is in every detail, except for the



slight difference in mesh and weight of fabric, the equivalent of the Pittsburgh Chain Link Fences previously described.

All Pittsburgh Complete Chain Link Fences are designed and manufactured to meet or exceed the most rigid requirements, including A.S.T.M. specifications.

Miscellaneous Construction

In connection with complete Pittsburgh Chain Link Fences, such items as removable panels for transformer station enclosures; overhead-track slide gates, manually or mechanically operated; baseball backstops and fence end fans are available in standard designs. Special cantilever gates and special construction of all kinds can be supplied on estimate.

Erection Service

An erection service is available everywhere for Pittsburgh Chain Link Fence, either under direction of PITTSBURGH STEEL COMPANY erection superintendents or the thoroughly experienced crews of our distributors. If you prefer to have your own workmen install the fence, an erection superintendent to direct them will be furnished at a reasonable charge.

Diagram, Prices and Information

When writing for information and prices, may we suggest that you send a diagram or layout of the proposed job. If possible, send blue print with correct measurements and specifications.

Note: All weights and dimensions are nominal and are taken from full standard weight schedule adopted by manufacturers.

Other Pittsburgh Chain Link Products

Pittsburgh Chain Link fabric, made throughout to the high Pittsburgh standards of quality, is available in a wide range of gauges, meshes and fabric widths. The popular fabric for tennis court enclosures is our No. 11 gauge, 1¼-in. mesh, made in single panels up to 12 ft. in width. Other fabrics for fur farming fences, window guards, partitions, flexible belting, etc., are available—ranging from the heavy fence fabrics to smaller meshes and light gauges for special purposes.

Other Pittsburgh Products

In addition to the products illustrated and referred to in these pages, PITTSBURGH STEEL COMPANY manufactures under the "Pittsburgh" family name, a number of other related items, some of which are listed here:

Steel and Wire Products—Barbed Wire, Gates, Posts, Fence Fittings, Fence Tools, Staples, Nails (all kinds), Spring Wire, Bright Wire, Annealed Wire, Zinc Coated (galvanized) Wire, Bale Ties.

Concrete Reinforcing, Pittsburgh Steeltex (wire reinforcing mesh with integral fibrous backing) for Interior Plaster, Stucco, Brick or Stone Veneer, Floors, and for Modernizing.

Seamless Steel Tubular Products—Oil Well Casing, Drill Pipe, Tubing, Line Pipe, Cracking Still Tubes, Boiler Tubes, Power Piping, Refinery Piping, Refrigeration Piping, Coils, Mechanical Tubing.

THE STEWART IRON WORKS COMPANY, INC.

Manufacturers of Iron and Wire Fence, Grilles, Railing, Window Guards, General Iron, Bronze, Brass and Wire Work

925 Stewart Block
CINCINNATI, OHIO

Products

ORNAMENTAL IRON PICKET FENCE and GATES; CHAIN LINK WIRE FENCE and GATES; ROAD GUARD FENCE.

Also Bridge Railing, Stair Railing, Balcony Railing, Grilles, Vault Doors, Steel Shutters and Doors, Folding Gates, Window Guards, Wire Partitions, Jail and Prison Work, General Iron, Bronze, Brass and Wire Work.

Stewart
FENCES

Skilled Erection Service

Will be furnished to erect fence for customers, when desired, in any part of the country. For this service an economical charge is made.

Where customers desire to do their own erecting, complete instructions and setting diagrams are furnished or, if preferred, a Stewart Erection Superintendent will be furnished at a nominal charge to direct the work.

Facilities

This company has unsurpassed facilities for the manufacture of any of the products listed above. These facilities comprise a factory containing 350,000 sq. ft. of floor space; equipment of modern machinery; skilled workmen and a complete organization of engineers. This with nearly 50 years of experience insures the highest standard of work, prompt service and reasonable prices.

Iron Fence and Gates

This company specializes in the building of high grade plain and ornamental iron fence and gates for every known type of property. These are constructed from the designs of its own draftsmen or from specifications submitted by customers.

Free counsel is offered in advising the type of fence best adapted to particular conditions.

Structural Advantages of Stewart Iron Fences

Stewart Iron Fences possess two decided structural advantages that merit your close investigation.

(A) Our Oval-Back I-Beam Fence Post by reason of its unusual strength eliminates the need for back braces with obvious advantages to users.

(B) Our Special Patented 3-Ribbed Channel Rail makes for superior strength as an extra rib of metal is provided at the point of caulking.

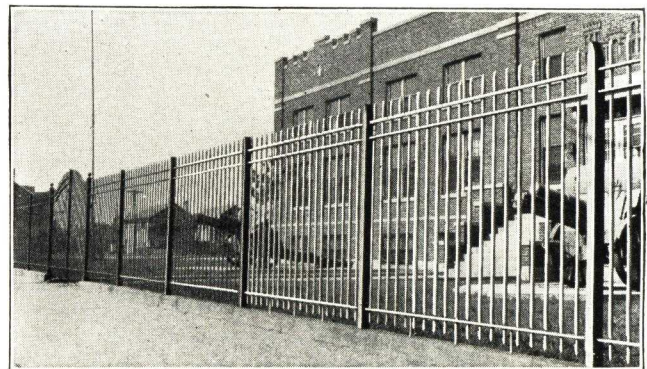
Information Required for Estimates

In writing for prices or ordering, send us a pencil diagram or layout, giving the property dimensions, location and width of gates and number of corner and end posts that are required.

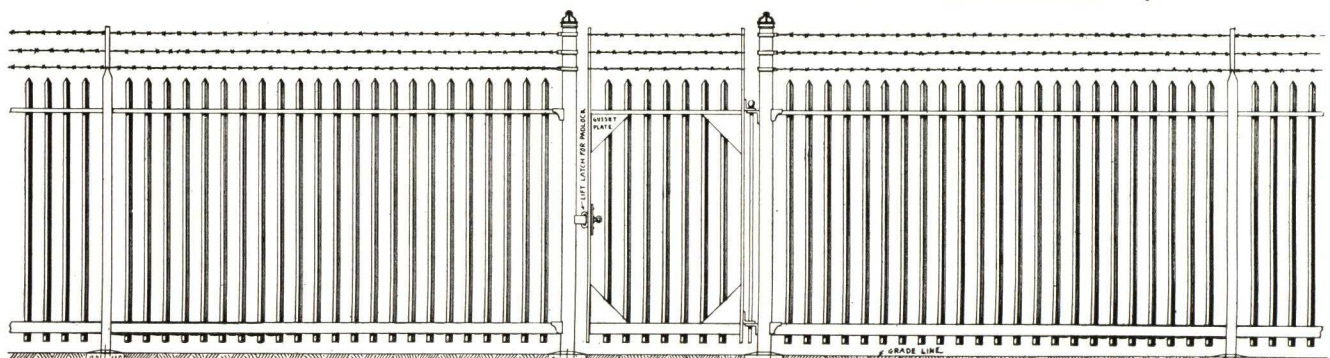
Our complete catalogue is available upon request.



Industrial Fence Constructed of Four Horizontal Rails, Straight Pickets and Special Design Posts, Factory of The Procter & Gamble Co., Cincinnati, Ohio



Iron Fence Design No. 952 Three Rails, Square Pickets. Line Posts of 3-in. I-Beams with Sheared Tops

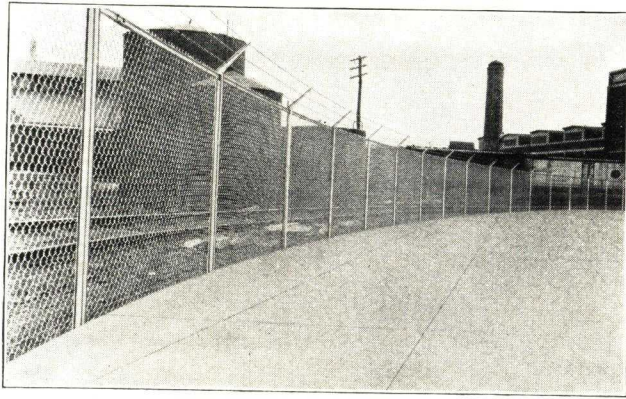


Heavy Type of Angle Picket Industrial Fence with Barbed Wire Overhang

Pickets 1x1 1/2-in. angle; top rail 2x1-in. channel; bottom rail 2x2 1/2-in. angle. Made any height desired

Stewart Chain Link Wire Fences

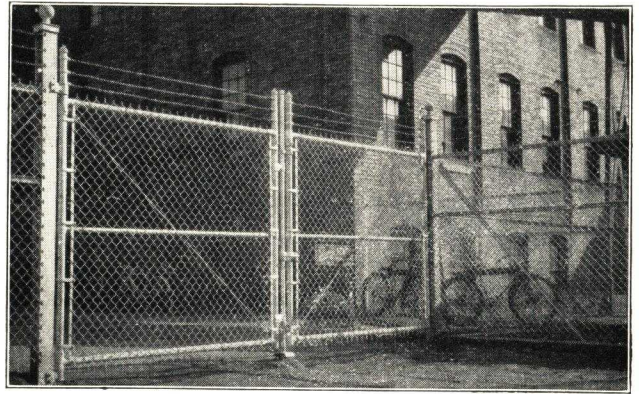
Made in types and sizes to meet every known requirement for fence. Catalogue mailed upon request.



Design 3TH Fence with Oval Back I-Beam Line Posts

Advisory Service, Erection, Estimates, etc.

Complete sales and erection service available through Stewart Fence Engineers throughout the country.



Stewart "Heavy Duty" Swing Gate

SPECIFICATION CHART FOR STEWART CHAIN LINK FENCES

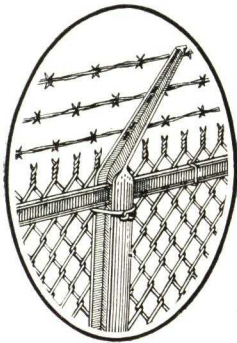
Stewart Fence Style	Height	Fabric		Line Posts	Top Rail	Width of Gates		End, Corner and Gate Posts	Barbed Wire Over-hang
		Mesh	Wire			Single	Double		
"Good Will" Light Residential	3' 9"	1½"	12 ga.	1⅝" Oval-back	1⅝" o.d. pipe	3' 6"	8' 6" or 10' 0"	1¾" Oval-back	None
"Harmony Fence" Light Property Division	3' 0" 3' 6" 4' 0"	2"	9 or 11 ga.	1¾" Oval-back or 2" o.d. pipe	1⅝" Oval-back or 1⅝" o.d. pipe	3' 0" to 6' 0"	6' 0" to 12' 0"	2¼" Oval-back or 2½" o.d. pipe	None
"OTM" Medium Residential	4' 0" 5' 0" 6' 0"	2"	9 or 6 ga.	1¾" Oval-back or 2" o.d. pipe	1¾" Oval-back or 1⅝" o.d. pipe	to order	to order	End, Corner and Gate Posts 2¼" Oval-back or 2½" o.d. pipe. Larger posts for extra wide gates.	None
"OTH" Parks, Playgrounds, etc.	5' 0" to 12' 0" inc.	2"	9 or 6 ga.	2¼" Oval-back or 2½" o.d. pipe	1¾" Oval-back or 1⅝" o.d. pipe	to order	to order	3" I-beam or 3" o.d. pipe End and Corner Posts 3" to 8⅝" Gate Posts	None
"3TM" Light Industrial	6' 0" only	2"	9 or 6 ga.	1¾" Oval-back or 2" o.d. pipe	1¾" Oval-back or 1⅝" o.d. pipe	to order	to order	End, Corner and Gate Posts 2¼" Oval-back or 2½" o.d. pipe. Larger posts for extra wide gates.	3 Strands
"3TH" Heavy Industrial	6' 0" to 12' 0" inc.	2"	9 or 6 ga.	2¼" Oval-back or 2½" o.d. pipe	1¾" Oval-back or 1⅝" o.d. pipe	to order	to order	End and Corner Posts 3" Gate Posts—3" to 8⅝"	3 Strands
"5TH" Heavy Industrial	7' 0" to 12' 0"	2"	9 or 6 ga.	2¼" Oval-back or 2½" o.d. pipe	1¾" Oval-back or 1⅝" o.d. pipe	to order	to order	End and Corner Posts—3" Gate Posts—3" to 8⅝"	5 Strands

Exclusive Structural Features of Stewart Chain Link Fence

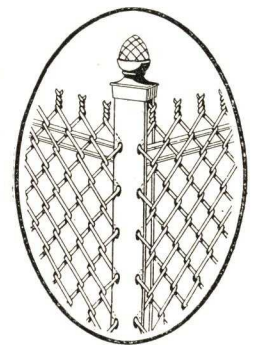
The Oval Back I-Beam line post with integral arm construction is the heaviest and strongest fence section in standard use. The same Oval Back section, in a smaller size, is used for a top rail where specified.

Through the use of open section fences members, Stewart makes internal moisture accumulation, which hastens rust, impossible.

We use a 3-in. I-Beam for corner post construction—the flanges of the post are slotted to accommodate the fabric which passes through each successive slot in "corkscrew" fashion. Such construction eliminates the need for bolts, end bands, tension bars, etc., which are often first to show signs of rust. Stewart fence approaches the nearest to the ideal—a boltless fence.

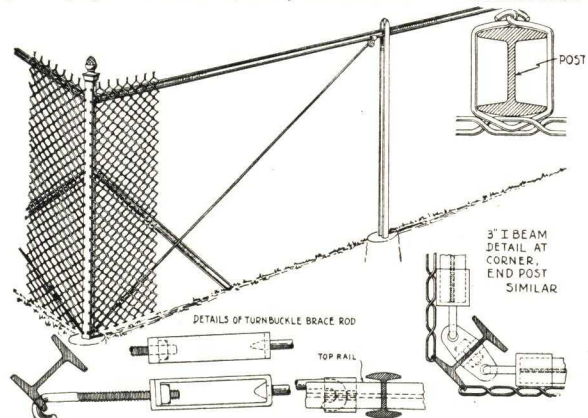
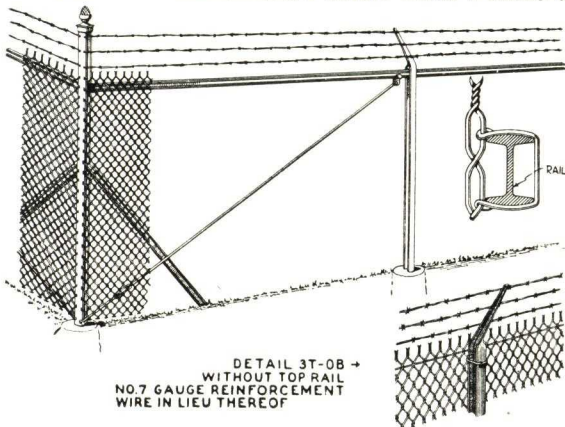


Oval Back I-Beam Post



Corner Post Construction

All Stewart Chain Link Fences are completely galvanized after fabrication



WICKWIRE SPENCER STEEL COMPANY

Manufacturers of Wire and Iron Fences and Gates

41 East 42nd Street
NEW YORK, N. Y.

OFFICES AND WAREHOUSES

WORCESTER, MASS., 80 Webster Street
CHICAGO, ILL., 221 No. La Salle Street
LOS ANGELES, CAL., 1070 No. Alameda Street
TULSA, OKLA., 314 E. Archer Street

SAN FRANCISCO, CAL., 144 Townsend Street
SEATTLE, WASH., 1025 Sixth Avenue, South
PORTLAND, ORE., 361 14th Street, North
JACKSONVILLE, FLA., P. O. Box 4733

BUFFALO, N. Y., River Road

Products

CHAIN LINK FENCES and GATES; ORNAMENTAL IRON FENCES and GATES.

For Clinton Electrically Welded Wire Fabric for Concrete Reinforcement, see Manufacturers' Index.

Advisory and Erection Service, Estimates, etc.

Engineers, architects and contractors are invited to write our service department for any assistance in helping to solve their fence problems. We will be glad to furnish estimates in accordance with all standard specifications, engineer's or architect's designs or any special design. Complete fence catalogue and specifications for standard designs will be gladly mailed on request.

Chain Link Wire Fences

Sizes—As follows:

2-in. mesh, No. 9 gauge.

2-in. mesh, No. 6 gauge.

1¾-in. mesh, No. 11 gauge (for tennis court fencing only).*

Woven from specially drawn *copper bearing* steel wire, hot galvanized after weaving.

Barb Wire — Com-

posed of two strands of No. 12½ gauge galvanized steel wire with barbs spaced approximately 3 in. apart, 4-point pattern, galvanized after fabrication.

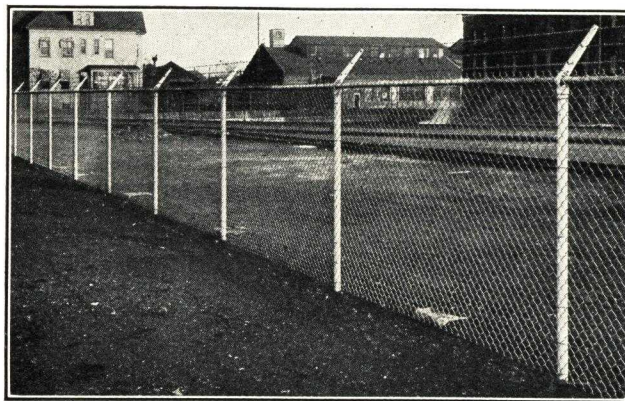
Framework—Constructed throughout from full weight, hot galvanized copper bearing steel.

Note: Types 320 and 323, gate posts 3 in. o.d. pipe for singles over 6 ft. and doubles over 12 ft. opening.

Types 420 and 423, gate posts 4 in. o.d. pipe for singles over 6 ft. up to 13 ft. and doubles over 12 ft. up to 26 ft. Over these openings use 6½ o.d. pipe posts.

Bracing—Each end and gate post will be equipped with one, and each corner post with two 1½-in. outside diameter horizontal tubular braces and adjustable truss brace between the terminal post and the first line post, complete with all fittings, on fences 5 ft. and over in height. Where no rail is used, we furnish two braces for each end and four for each corner on fences 6 ft. and over in height.

Gates—The gates are constructed of pipe frame, properly braced to eliminate sagging, filled with fabric to match fence, equipped with adjustable hangers, locking device and back catches for holding in place when open.



SPECIFICATIONS OF CHAIN LINK WIRE FENCES

Type No.	Residential	Light industrial	Parks and playgrounds*		Heavy industrial—oil bulk, plants, factories, etc.			
	320	323	420	420H	423	423H	425	425H
Height, ft.	3 to 6	5 and 6	4 to 12	5 to 12	6 to 12	6 to 12	6 to 12	6 to 12
Fabric	2 in., No. 9 or 2 in., No. 6	2 in., No. 9 or 2 in., No. 6	2 in., No. 9 or 2 in., No. 6	2 in., No. 9 or 2 in., No. 6	2 in., No. 9 or 2 in., No. 6	2 in., No. 9 or 2 in., No. 6	2 in., No. 9 or 2 in., No. 6	2 in., No. 9 or 2 in., No. 6
Line posts, in.	2 o.d. pipe	2 o.d. pipe	2½ o.d. pipe	2¼ x 1½ "H" col.	2½ o.d. pipe	2¼ x 1½ "H" col.	2½ o.d. pipe	2¼ x 1½ "H" col.
†Top rail, o.d. pipe, in.	1½	1½	1½	1½	1½	1½	1½	1½
End-corner gate posts, o.d. pipe, in.	2½	2½	3	3	3	3	3	3
Barb wire	None	3 strands	None	None	3 strands	3 strands	5 strands	5 strands

*This type also used for tennis court fencing, substituting 1¾ in., No. 11 fabric in 8, 10 and 12-ft. heights.

†For fence without top rail substitute a zero (0) in middle figure of type number, i.e.: 320 with top rail; 300 without top rail.

VULCAN RAIL & CONSTRUCTION COMPANY

MAIN OFFICE AND WORKS

Grand Street and Garrison Avenue
MASPETH, N. Y.

BRANCH OFFICE AND SHOPS: 39th Street and A. V. R. R., PITTSBURGH, PA.

VULCAN PIPE AND BRIDGE RAILINGS

Facilities

We are fully equipped to manufacture railing products, having a trained force of skilled and experienced workmen, which insures prompt and efficient execution of all orders. Both plants are located on main line railroads and have private sidings.

Service

We offer to Engineers and Architects the service of our Engineering Department to advise with them or aid them in any railing problem or in any other problem involving the use of pipe and fittings in construction work.

Vulcan Products

PIPE RAILINGS, FENCES and SPECIAL CONSTRUCTION for:

<i>Auditoriums</i>	<i>Sewage Treatment</i>
<i>Boardwalks</i>	<i>Works</i>
<i>Bridges</i>	<i>Stadia</i>
<i>Elevated Structures</i>	<i>Stairs</i>
<i>Grandstands</i>	<i>Theatres</i>
<i>Prisons</i>	<i>Warehouses, etc.</i>

SPECIAL PIPE WORK for:
Fur Storage Racks *Table Supports*
Platform Shelters *Turnstiles, etc.*

STAIRS, LADDERS, etc., with RAILINGS for:
Coal Breakers *Dams*
Subways *Power Plants*
Hydroelectric Plants

Also Vulcan "All-Steel" Underwriters' Fire Doors for protection of corridors and partition openings in storage warehouses.

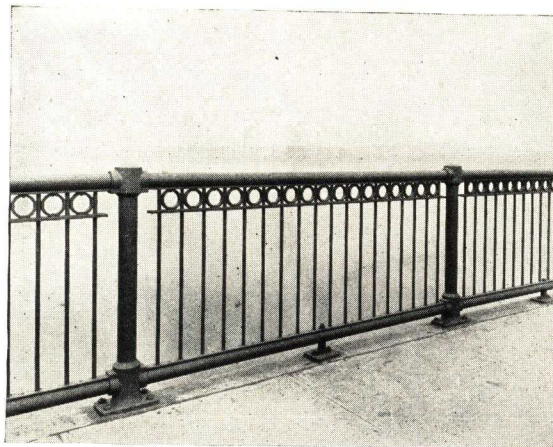
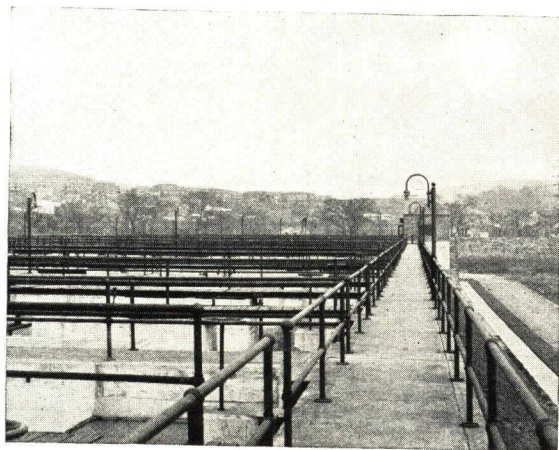
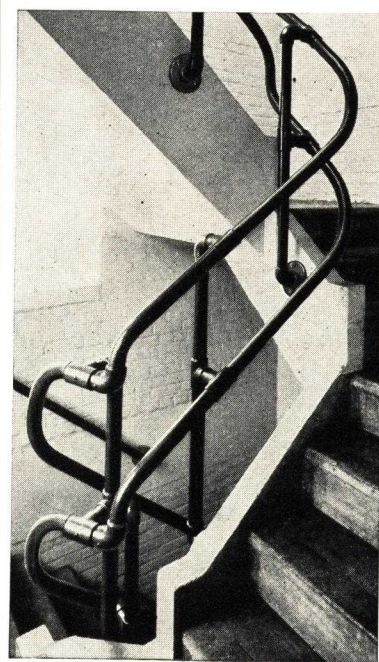
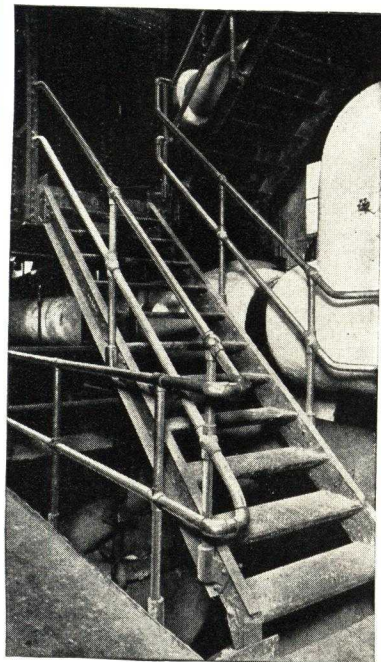
Specific Information

Complete information, including estimates and preliminary designs for any of the products illustrated, or listed above will be promptly supplied on request. Catalogue sent on application.

Quality
Materials



Prompt
Shipment



JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS

Jones & Laughlin Building
PITTSBURGH, PA.

For Sales Offices and Warehouses, see pages on Tubular Products

Products

J & L LIGHT WEIGHT CHANNELS for Stair Stringers and other uses.

Also J & L Structural Shapes and Fabricated Structural Work, Columns, Girders, Trusses, Plate Work, Tanks, Mill and Factory Buildings; J & L Junior Beam; J & L Wire Products.

For J & L Bars for Concrete Reinforcement, Steel Piling, and Tubular Products, see page numbers in Manufacturers' Index.

Description of J & L Light Weight Channels

J & L Light Weight Channels are produced on modern rolling mills and are similar in type to standard channel sections. They have constant dimensions, making fabricating and fitting to other work economical.

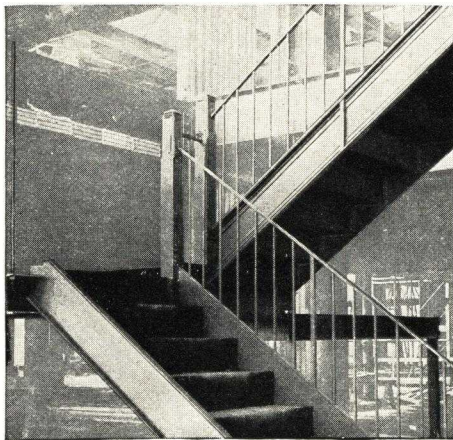


Due to the rolled shape, the material is ready, as received, for fabrication into various uses, including stair stringers, thereby saving time.

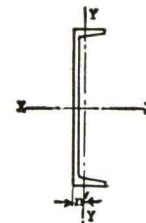
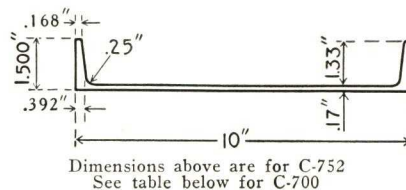
The rolled shape also reduces to the minimum shop equipment for fabrication. J & L Light Weight Channels are economical in weight and form a strong structure. The lines are straight and true, resulting in proper fitting at the joints, thus making a well-finished installation.

These sections are now available in two sizes: 10 in. 8.4 lb. per ft. and 12 in. 10.6 lb. per ft.

J & L Light Weight Channels are available for immediate shipment from the following points: Chicago, Cincinnati, New Orleans, Pittsburgh and Detroit. Carried in lengths of 20, 25, 30, 40 and 50 ft.



Typical Installation



DIMENSIONS

Section index	Depth of channel, in.	Wt. per ft., lbs.	Flange width		Web thickness	
			In. and decimal parts	In. and fractional parts	Decimal parts of in.	Fractional parts of in.
C-752	10	8.4	1.500	1 1/2	.170	1 1/64
C-700	12	10.6	1.500	1 1/2	.190	3/16

PROPERTIES OF SECTIONS

Area, sq. in.	Axis X-X (perpendicular to web)			Axis Y-Y (parallel to web)			
	I	r	S	I'	r'	S'	n'
2.47	32.3	3.61	6.5	0.33	0.37	0.28	0.29
3.12	55.8	4.23	9.3	0.39	0.35	0.32	0.27

ALLOWABLE LOADS

	Index No.	Depth of channel, in.	Wt. per ft., lbs.	Bend mom., ft. lbs.	Max. load	Span, feet																									
						2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
						Fiber Stress, 18,000 Lbs. per Sq. In.																									
Total load in thousands of pounds	C-752	10	8.4	9680	40.8	38.7	25.8	19.4	15.5	12.9	11.1	9.7	8.6	7.7	7.0	6.5	6.0	5.5	5.2	4.8	4.6	4.3	4.1	3.9	3.7	3.5	3.4	3.2	3.1	3.0	
Total deflection, in.						.007	.017	.030	.047	.067	.091	.119	.151	.186	.225	.268	.315	.365	.419	.477	.538	.603	.672	.745	.821	.901	.985	1.073	1.164	1.259	
Total load in thousands of pounds	C-700	12	10.6	13947	54.7		37.2	27.9	22.3	18.6	15.9	13.9	12.4	11.2	10.1	9.3	8.6	8.0	7.4	7.0	6.6	6.2	5.9	5.6	5.3	5.1	4.9	4.6	4.5	4.3	
Total deflection, in.						.006	.014	.025	.039	.056	.076	.099	.126	.155	.188	.223	.262	.304	.349	.397	.449	.503	.560	.621	.684	.751	.821	.894	.970	1.05	
Load in lbs. per lin. ft. of channel	C-752	10	8.4			19360	8634	4840	3098	2151	1580	1211	956	774	640	538	458	395	344	303	268	239	215	194	176	160	146	134	124	115	
	C-700	12	10.6				12398	6974	4463	3100	2277	1743	1378	1116	922	775	660	569	496	436	386	344	309	279	253	231	211	194	179	165	

Fiber Stress, 16,000 Lbs. per Sq. In.																														
Total load in thousands of pounds	C-752	10	8.4	8604	34.0		22.9	17.2	13.8	11.5	9.8	8.6	7.6	6.9	6.3	5.7	5.3	4.9	4.6	4.3	4.0	3.8	3.6	3.4	3.3	3.1	3.0	2.9	2.8	2.6
Total deflection, in.							.015	.026	.041	.060	.081	.106	.134	.165	.200	.238	.280	.324	.372	.424	.478	.536	.597	.662	.730	.801	.875	.953	1.034	1.119
Total load in thousands of pounds	C-700	12	10.6	12398	45.6		33.1	24.8	19.8	16.5	14.2	12.4	11.0	9.9	9.0	8.3	7.6	7.1	6.6	6.2	5.8	5.5	5.2	5.0	4.7	4.5	4.3	4.1	4.0	3.8
Total deflection, in.							.012	.022	.034	.050	.068	.088	.112	.138	.167	.199	.233	.270	.310	.353	.399	.447	.498	.552	.608	.667	.729	.794	.862	.932
Load in lbs. per lin. ft. of channel	C-752	10	8.4				7648	4302	2753	1912	1405	1076	850	688	569	478	407	351	306	269	238	212	191	172	156	142	130	120	110	102
	C-700	12	10.6				11020	6199	3967	2755	2024	1550	1224	992	820	689	587	506	441	387	343	306	275	248	225	205	187	172	159	147

Note: Loads above lines at left will produce maximum allowable shear in webs; loads above lines at right will produce excessive deflections.

AMERICAN ABRASIVE METALS CO.

Anti-Slip Stair Treads, Floor Plates, Elevator Sills

50 Church Street, NEW YORK, N. Y.

PLANT: IRVINGTON, NEW JERSEY

BRANCHES

CHICAGO, ILL., Conway Building
PITTSBURGH, PA., Farmers Bank Building

PHILADELPHIA, PA., 1700 Walnut Street
BOSTON, MASS., 10 High Street

SAN FRANCISCO, CAL., 405 Call Building
LOS ANGELES, CAL., 2071 Laura Avenue

AGENCIES IN PRINCIPAL CITIES

Products

FERALUN, BRONZALUN, ALUMALUN, NICALUN for Anti-Slip Tread Surfaces; FERALUN BRAKE SHOES for Mine Motors; FERALUN and PLUMBALUN for Rabble Blades and other wear resisting uses; FERROX for Drill and Torch Resistant Bank Vault Linings and Door Plates.

Uses

Anti-slip castings for stair treads, landings, ramps, floor plates around moving machinery, loading platforms, drainage gratings, coal hole covers, swing door saddles, elevator sills, etc.

Material

Feralun, *Bronzalun*, *Alumalun* and *Nicalun* are the trade mark names given by the AMERICAN ABRASIVE METALS CO. to their anti-slip castings. The metal matrix used is indicated by the name *Feralun* for iron, *Bronzalun* for bronze, etc. These trade mark names may be used in specifications without further description or qualification.

The anti-slip properties of these materials are provided by incorporating in the wearing surface at the time of casting, grains of the hardest known electric furnace abrasive. These abrasive grains afford not only protection against the slipping hazard, but extreme durability. American Abrasive Metal Products once installed, will eliminate entirely all expense for maintenance or repair. They are weather resistant and may be used in exposed as well as in protected locations.



Accident Prevention

A surprising number of accidents, both in and out of industry, are caused by falls on unsafe walkway surfaces. The fact that many of these accidents are unspectacular, does not reduce the loss they involve to employers, employees and the general public. Recent data indicates that falls are exceeded only by motor vehicles as a cause of

serious injury, and that more than half of the casualties resulting from falls are caused by slipping or tripping on unsafe stairs and walkways.

The use of the appropriate abrasive metal castings, *Feralun*, *Bronzalun*, *Alumalun* and *Nicalun*, will eliminate the cause and consequently prevent the vast majority of accidents of this nature.

Details

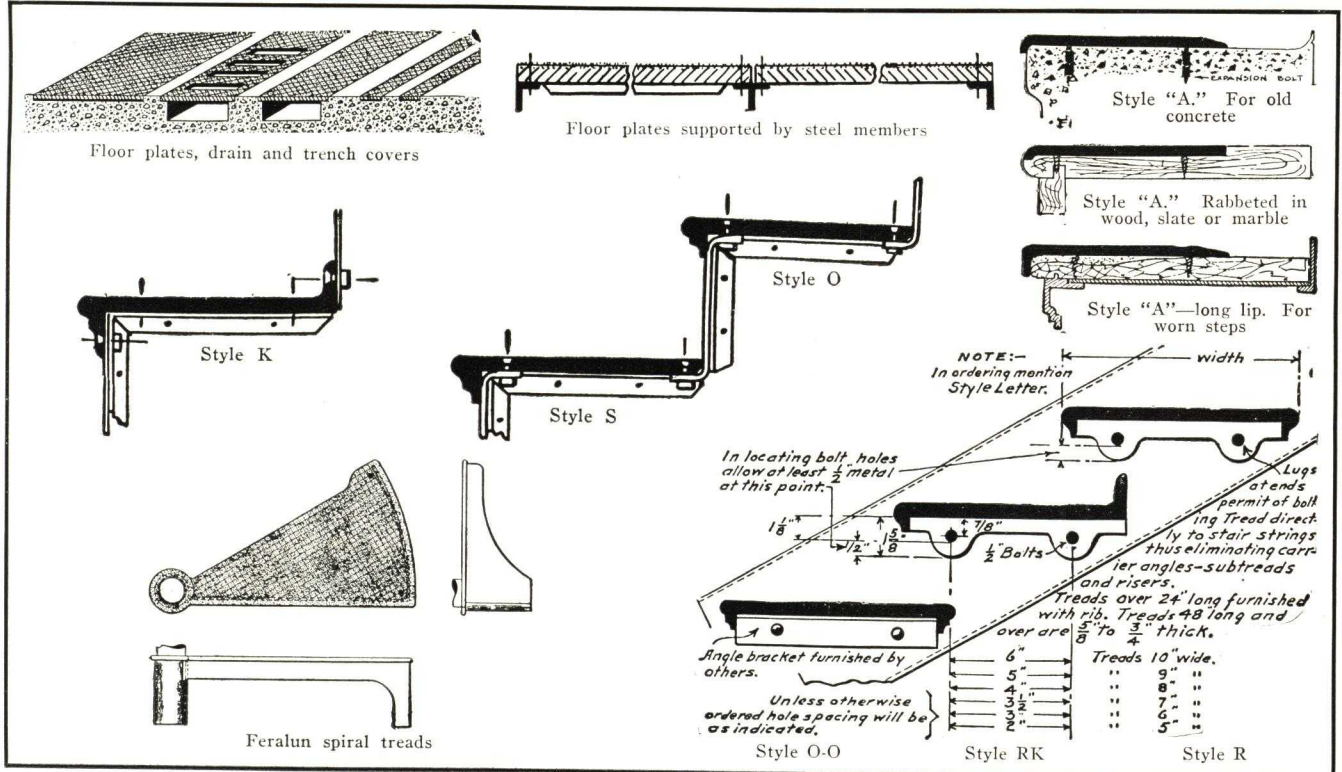
Illustrations of a few of the more common types of abrasive faced castings produced by the AMERICAN ABRASIVE METALS CO. are shown below.

Since they are foundry products, they may be produced in any size or design, consistent with sound foundry practice.

The surface may be hatch, plain or fluted as desired.

Cost

The AMERICAN ABRASIVE METALS CO. will appreciate an opportunity to furnish details and prices for proposed installations in both new and old construction. Costs are remarkably low.



AMERICAN MASON SAFETY TREAD CO.

GENERAL OFFICE AND FACTORY
LOWELL, MASS.

DISTRIBUTERS

JOHN B. RICKETTS
Kansas City, Mo.

Western Missouri
Kansas
Oklahoma

JOSEPH T. RYERSON & SON, Inc.
New York, N. Y.
Boston, Mass.
St. Louis, Mo.
Detroit, Mich.
Milwaukee, Wis.
Buffalo, N. Y.

Chicago, Ill.
Philadelphia, Pa.
Cleveland, Ohio
Minneapolis, Minn.
Cincinnati, Ohio

DARLING BROS., LTD.
(Canadian Representatives)
Montreal
Halifax
Winnipeg
Toronto
Ottawa
Calgary
Vancouver

PRODUCTS

MASON SAFETY TREAD (Steel Base—Lead or Abrasive Filled)

MASON SAFETY TREAD (Brass Base—Lead or Abrasive Filled)

MASON SAFETY TREAD (Aluminum Base—Lead or Abrasive Filled)

MASON ABRASIVE METAL SAFETY TREAD (Iron, Bronze, Aluminum or Nickel)

MASON STRUCTURAL SAFETY TREAD (Iron or Bronze)

MASON THRESHOLDS (Rolled Steel, Extruded Brass or Aluminum)

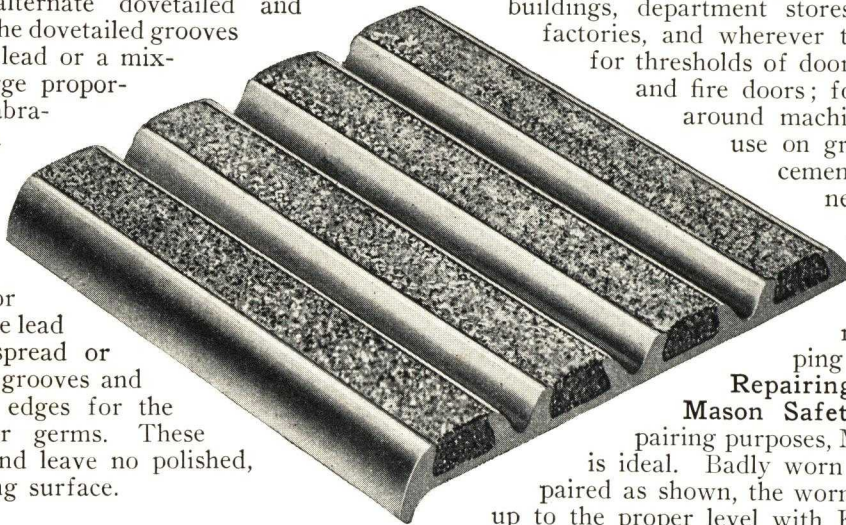
MASON STAIR NOSINGS and EDGINGS (Extruded Brass or Aluminum)

MASON NON-SLIP LADDER SHOES

KARBOLITH SANITARY FLOORING

MASON SAFETY TREAD (LEAD OR ABRASIVE FILLED)

Mason Safety Treads are made of rolled steel or extruded hard brass (delta metal), or aluminum, $\frac{1}{4}$ -in. thick with alternate dovetailed and U-shaped grooves. The dovetailed grooves are filled either with lead or a mixture containing a large proportion of aluminous abrasive firmly held in place by the continuous supporting ribs, which give long wear, preserving the non-slipping quality of the tread for years. The lead, in the lead filled tread, cannot spread or creep to fill the open grooves and there are no jagged edges for the retention of filth or germs. These treads wear evenly and leave no polished, dangerous, slip-inviting surface.



Uses of Mason Safety Treads—Mason Safety Treads are especially desirable for stairs in school buildings, department stores, industrial plants, factories, and wherever the traffic is heavy; for thresholds of doors, elevator openings and fire doors; for ramps and floors around machinery. Suitable for use on granite, marble, slate, cement, iron or wood—new or old construction. Especially desirable on concrete stairs, as they prevent the raw edge from chipping off.

Repairing Worn Stairs with Mason Safety Tread—For repairing purposes, Mason Safety Tread is ideal. Badly worn stair treads are repaired as shown, the worn portion being built up to the proper level with Karbolith or cement filling, on which is placed the safety tread, to which is attached a formed steel or angle iron nosing.

Our long experience enables us to give directions for the repair of any stairway, of any material and degree of wear. We will furnish without obligation suggestions, sketches or blueprints, showing just how the work can be done best and at the lowest cost.

STANDARD SIZES OF MASON SAFETY TREAD

Steel Base, Lead or Abrasive Filled

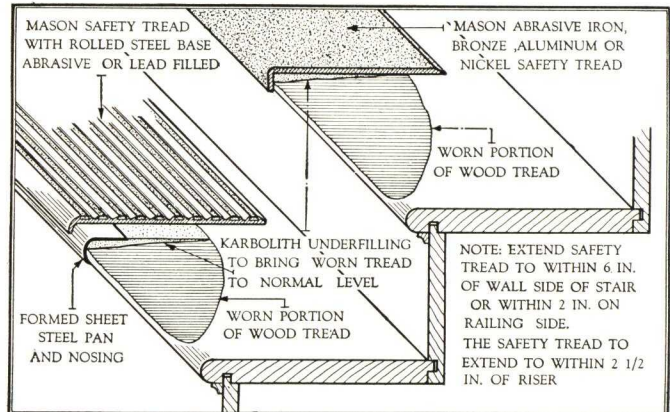
Fig. No.	No. of ribs	Width, in.	Front edge
1A	7	6	Nosing
1	7	6	Plain
2A	5	4	Nosing
3	5	4	Plain
3A	4	3 $\frac{3}{4}$	Plain
4	4	3 $\frac{1}{2}$	Nosing
5	3	3*	Nosing
6	3	2 $\frac{1}{2}$	Plain

Brass and Aluminum Base, Lead or Abrasive Filled

Fig. Number		No. of ribs	Width, in.	Front edge
Brass	Aluminum			
7	41	8	6	Plain
7A	Not made	6	5 $\frac{1}{4}$	Nosing
8	40A	5	4	Plain
Not made	40	5	4	Nosing
11	Not made	4	3 $\frac{1}{2}$	Nosing
9	39	4	3	Plain
11A	42	4	3*	Nosing
10	Not made	3	2 $\frac{1}{4}$	Plain
12	Not made	3	2 $\frac{1}{8}$	Nosing
12A	Not made	3	2 $\frac{1}{8}$	Deep nosing
14	Not made	3	2 $\frac{3}{4}$	Deep nosing
14A	Not made	4	3 $\frac{1}{2}$	Deep nosing

All treads cut to length, punched and countersunk in U-Grooves for screws. Concrete anchors supplied when specified.

*Three inch wide sections come with nosing and square back, especially made for use in concrete or with $\frac{1}{4}$ -in. thick linoleum floor covering.



Mason Safety Tread as Applied to Worn Treads

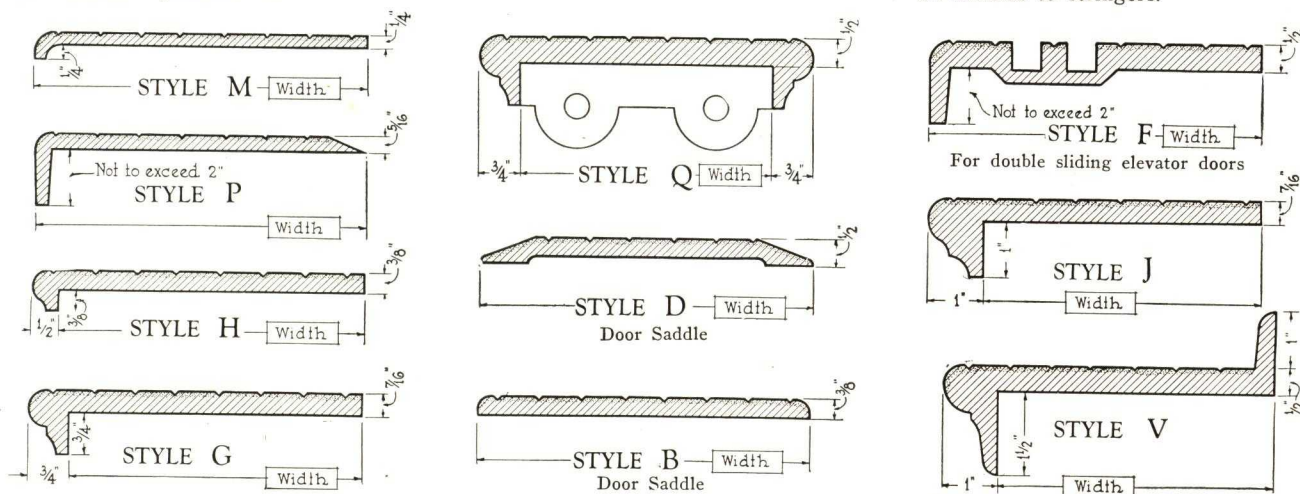
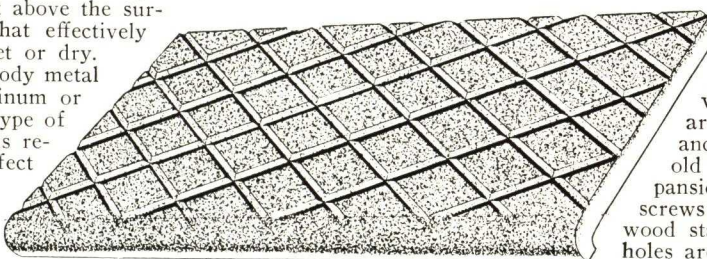
MASON ABRASIVE METAL SAFETY TREADS

A cast safety stair tread in which aluminous abrasive is embedded in the wearing surface. The abrasive is an integral part of the body metal and the flintlike particles of the abrasive project above the surface, producing a surface that effectively prevents slipping whether wet or dry.

They are furnished with body metal of iron, brass, bronze, aluminum or nickel—depending upon the type of service for which the tread is required or the architectural effect desired.

Extreme hardness and wear-resisting qualities of abrasive material, combined with similar qualities of

metal body, produce an extremely durable safety tread. Mason Abrasive Iron Treads possess a high resistance to corrosion due to addition of the aluminous abrasive at time of casting which tends to densify the metal. Treads are easily and quickly installed on new or old work. On new concrete the treads are fastened by screws and metal anchors embedded in concrete. For old concrete, marble, slate, etc., expansion bolts are recommended. Wood screws hold treads securely in place on wood stairs. End lugs or countersunk holes are provided where treads are to be secured to stringers.



DETAILS OF MASON ABRASIVE METAL SAFETY TREAD

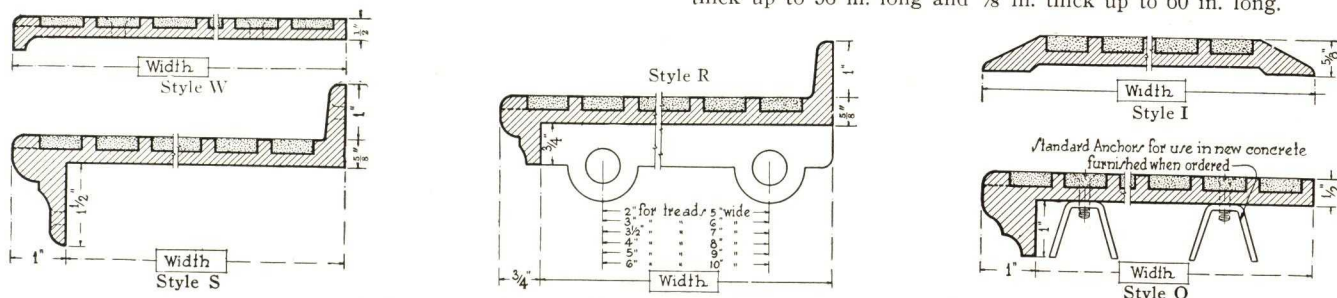
SCALE 0" 1" 2" 3" 4"

MASON STRUCTURAL TREAD

Mason Structural Tread is a complete step and safety tread combined. It requires no sub-tread, can be installed with or without a riser. Furnished ready to bolt to stair case stringers if so desired. This tread consists of a channel cast iron base, filled with Mason abrasive filling, which extends to the extreme front edge. The dentil nosing prevents any possibility of slipping or misstepping.

Uses—Mason Structural Tread can be used with any type of iron stair construction.

How Furnished—Mason Structural Treads are furnished in any tread width, in lengths up to 60 in. Recommended thickness depends on size. Treads which are to be installed on top of concrete or any solid foundation may be 1/2 in. thick up to 60 in. long. Treads which are self-supporting should be 1/2 in. thick up to 36 in. long and 3/8 in. thick up to 60 in. long.



Nosings Made Similar to Abrasive Metal Safety Treads (Shown Above)

MASON DOOR THRESHOLDS

Brass—Corrugated or Plain Surface

Width 4 in.; height 1/2 in.
Width 5 in.; height 1/2 in.
Width 6 in.; height 1/2 in.

Cut to length



Aluminum—Corrugated Surface Only

Width 4 in.; height 5/8 in.
Width 5 in.; height 5/8 in.
Width 6 in.; height 5/8 in.

Cut to length

Rolled Steel Corrugated Surface Only; Width 4 In., Height 9/16 In.; Width 5 1/4 In., Height 5/8 In.; Width 7 In., Height 5/8 In.; Cut to Length

UNIVERSAL SAFETY TREAD INC.

111 Perry Street, LOWELL, MASS.

Products

UNIVERSAL ANTI-SLIP METAL TREAD (Abrasive) Type I.
UNIVERSAL SAFETY TREAD (Lead filled) Type II.
Also Brass and Aluminum Nosings, Brass and Aluminum Door Saddles, Steel Door Saddles.

General Uses

For installation on all stairs and landings of any construction, such as iron, wood, slate, stone, concrete or marble; ramps, runways, platforms, train pits, elevator door thresholds, saddles, ladders, frames around vault lights, coalhole covers and all surfaces that might become slippery.

Universal Anti-Slip Metal Tread, Type I

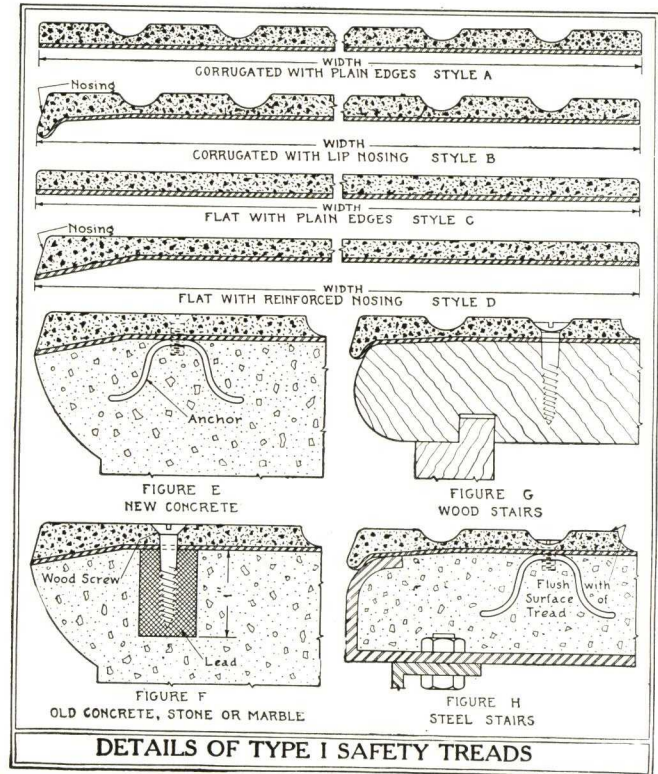


Flat Style D with Reinforced Nosing

This tread is constructed of a tinned steel baseplate to which is attached abrasive grains by means of a lead binder. The diamond hard grains are distributed throughout the entire thickness to the baseplate, and the lead fills all voids. This construction gives a moisture-proof, non-porous, scuff-proof, and anti-slip tread for its entire life and will withstand the most severe wear under heavy traffic. A flat or corrugated surface can be furnished as preferred.

During many years of experience in manufacture, we have perfected this safety tread in which there are no hard or slippery metal surfaces exposed. This tread fulfills the most exacting requirements.

Sizes—Universal Anti-Slip Tread Type I can be furnished in practically any width up to 8 in. and in any specified length either with or without nosing.



Universal Safety Tread (Lead Filled), Type II

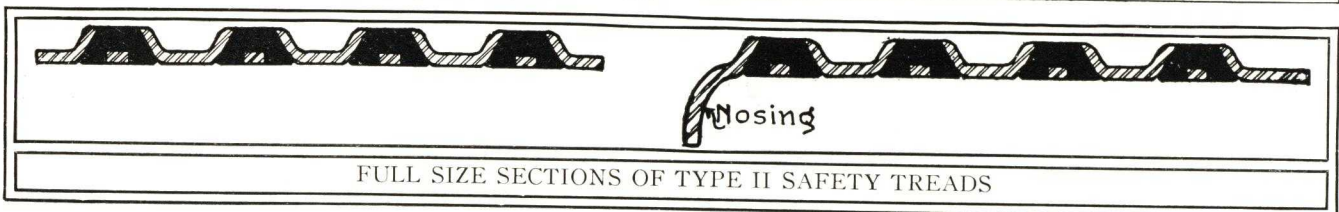
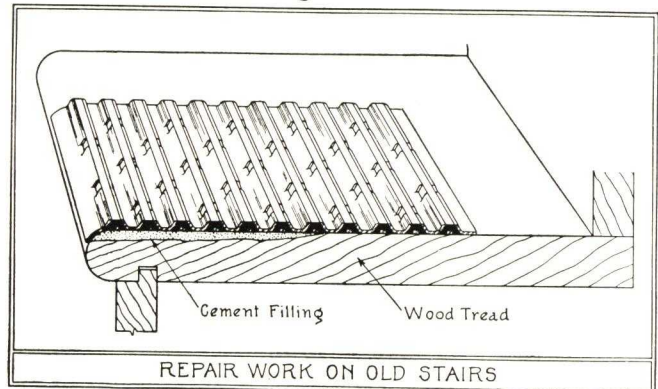


Lead Filled, Type II with and without Nosing

This tread is constructed of a steel, brass, aluminum or stainless steel baseplate, punched to receive the non-slip lead inserts which are rolled in and firmly clamped. The lead fills all perforations and a non-slip surface is presented for the life of the tread. A minimum of hard supporting metal and a maximum of non-slip lead form the wearing surface, and the lead

exposed between the base supports or clamps results in perfect non-slip edges at all times.

Sizes—Universal Safety Tread Type II can be furnished in practically any width up to 12 in. and in any specified length either with or without nosing.



ARROWHEAD IRON WORKS, INC.

431 West Fifth Street, KANSAS CITY, MO.

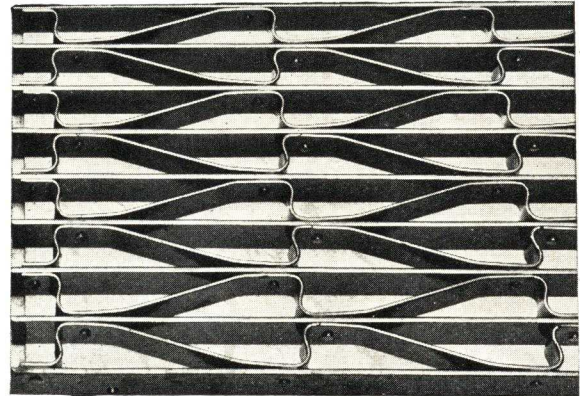
EASTERN LICENSEE: Frank Pettit Ornamental Iron Works, 1505 N. Mascher Street, PHILADELPHIA, PA.

Arrowhead Products Are Footsafe

The diagonal and transverse bracing of Arrowhead provides a positive bar to a slip in any direction, regardless of working conditions. Square-edged steel is used in Arrowhead for maximum gripping qualities.



Type M Grating (Rectangular Mesh)



Types A and G Grating (Continuous Crimp)

Arrowhead Riveted Grating (Patented)

Arrowhead Grating is furnished in two designs,

Type M—This type is furnished where acute angles will retard self-cleaning, and where ventilation and light weight are factors. In common with all rectangular design gratings, it is less adapted for use where subjected to small-wheeled trucks and similar traffic.

Arrowhead Treads (Patented)

Arrowhead Treads are designed to include no unnecessary metal. They are light in weight, but will carry loads far in excess of usual requirements. The continuous

continuous crimped (Types A and G), and rectangular (Type M).

Types A and G—The construction of these types incorporates the full truss principle, distributing concentrated loading over a wide area, and entirely eliminating side-sway. These types are recommended for use under heavy loads and small wheel traffic, as the areas of the openings are 3 sq. in., maximum.

Types A and G are identical, except in Type G the crimped bars are of narrower depth, all bars being flush at top of grating.



At Left:
Arrowhead Tread

SAFE LOAD TABLE, ARROWHEAD, TYPES A, G AND M
IN POUNDS PER SQUARE FOOT

DEPTH	ST. BARS	CR. BARS	SQ. FT. WEIGHT	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	9'-0"	10'-0"
3/4"	1/8"	1/8"	6#	326	231	171											
1"	1/8"	1/8"	8#	574	399	297	232	180									
1 1/4"	3/16"	1/8"	12 1/2 #	1139	797	535	448	356	247	235	190						
1 1/2"	3/16"	1/8"	15#	1769	1243	909	692	555	451	371	313	280	237	186	167		
1 3/4"	3/16"	1/8"	17 1/2 #	2450	1690	1357	906	692	560	476	397	341	293	258	228		
2"	1/4"	1/8"	22#	3327	2347	1787	1360	1087	800	677	567	458	397	356	302	264	188
2 1/2"	1/4"	1/8"	27 1/2 #	4386	3390	2609	2000	1703	1564	1329	996	781	588	492	397	382	276

Safe load table is based on fiber stress of 16,000 lbs. per square inch. For complete data of all types, write for our handbook.

nosing bar and cross braces not only form a solid, efficient frame for the grating web, but act as a tie and spacer between the stringers.

The deep nosing bar clearly defines the front of the tread, eliminating the danger of overstepping.

BLAW-KNOX COMPANY

Steel Grating

2041 Farmers Bank Building, PITTSBURGH, PA.

NEW YORK, N. Y., 342 Madison Avenue
CHICAGO, ILL., Peoples Gas Building

PHILADELPHIA, PA., 906 Widener Building
BIRMINGHAM, ALA., Brown-Marx Building

BUFFALO, N. Y., 356 Nassau Street
DETROIT, MICH., Book Tower Building

PACIFIC COAST DIVISION: Blaw-Knox & Western Pipe Corp., SAN FRANCISCO, CALIF.

EXPORT DIVISION: Blaw-Knox International Corp., PITTSBURGH, PA.

LONDON, ENGLAND, New Oxford House, Hart Street, HOLBORN, W. C. 1

PARIS, 8, FRANCE, 4 Place de Saussais

DUSSELDORF, GERMANY, 17 Bismarckstrasse

For other products, see Manufacturers' Index

Blaw-Knox Electroforged Steel Grating and Open Flooring

The advantages of actual one-piece construction presented exclusively by Blaw-Knox Electroforged Steel Grating will be especially apparent to those who have used, or are using today, ordinary grating which is mechanically assembled. It is a simple structure, electroforged for strength and permanence, marked by an entire absence of loose parts and characterized by an extremely low maintenance cost.

Exclusive Features of Blaw-Knox Electroforged Steel Grating

Non-slip — Perfect traction is afforded by the slightly rough edges of the twisted cross bars which protrude slightly above the surface of the bearing bars.

Greatest Strength — The electroforged one-piece construction—made without rivets, slots, or cuts in the metal—utilizes full strength of the gross amount of metal. The resulting one-piece section has maximum load-carrying capacity per pound.



Electroforged

Longest Life—Because of its design and exclusive method of fabrication Electroforged Grating presents a one-piece construction free from cracks, joints, or crevices of any kind. This also enables Electroforged Grating to be 100% protected by paint or galvanizing, leaving no part exposed to corrosive action.

One-piece Grating—Blaw-Knox Electroforged Grating is manufactured by laying the twisted bars across the top of the bearing bars without slotting or cutting the metal.

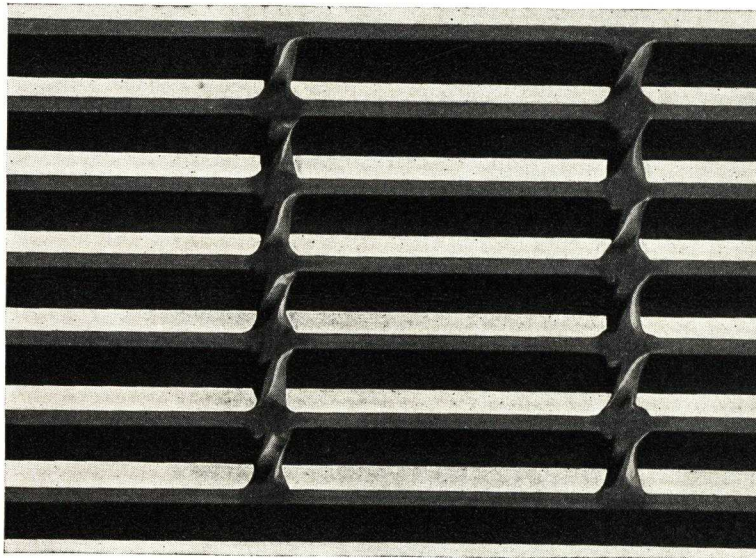
Enormous pressure and resistance welding electroforges the bar into one piece where the metals cross.

Self-cleaning — No acute angles or projections to collect debris.

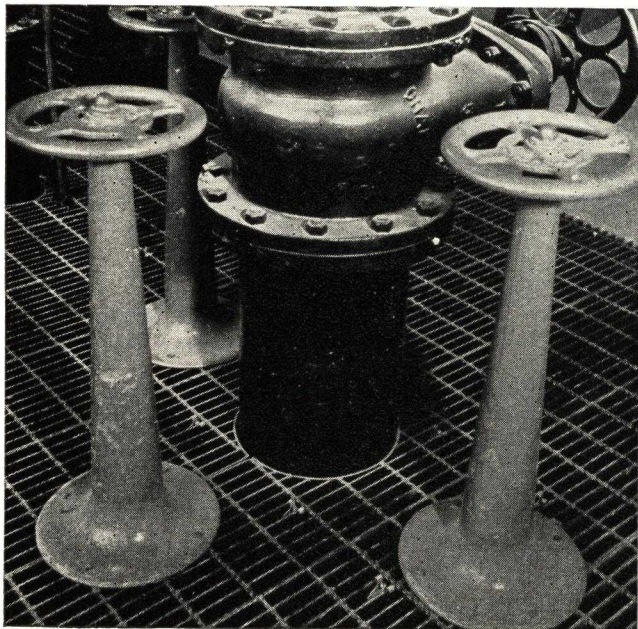
Better Light and Ventilation — The construction of Blaw-Knox Electroforged Grating permits clean-cut rectangular openings.

Maximum lighting and ventilation are assured.

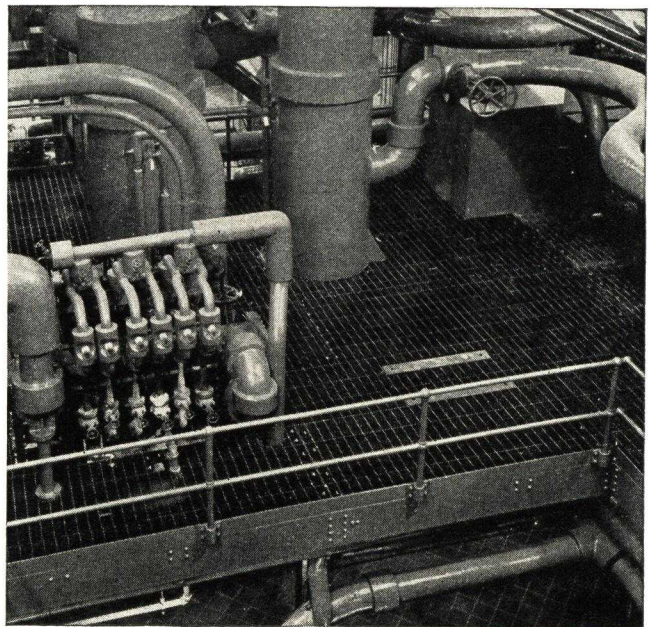
Easily Installed — Installation cost of Blaw-Knox Grating is reduced to a minimum by a very simple and secure method of fastening the grating.



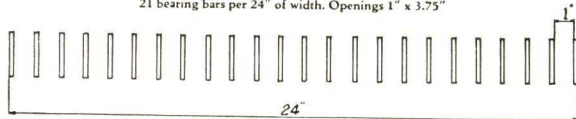
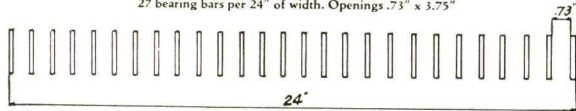
Section of Electroforged Steel Grating
Showing rigid welding and sharp, flat topped bars



Electroforged Grating in Camden (N. J.) County Park Pumping Station



Blaw-Knox Electroforged Grating Installed in Large Power Station

STANDARD GRATING
21 bearing bars per 24" of width. Openings 1" x 3.75"SPECIAL CLOSE MESH GRATING
Used where close spacing of bearing bars is desired
27 bearing bars per 24" of width. Openings .75" x 3.75"

TO FIND LOAD CAPACITY, WEIGHT AND DEFLECTIONS, ADD 20% TO STANDARD LOAD TABLE AND SPECIFICATIONS ABOVE

Grating Samples

The most convincing argument for the superior features of Blaw-Knox Electroformed Grating is the grating itself. An actual sample is yours for the asking.

Sizes of Electroformed Gratings

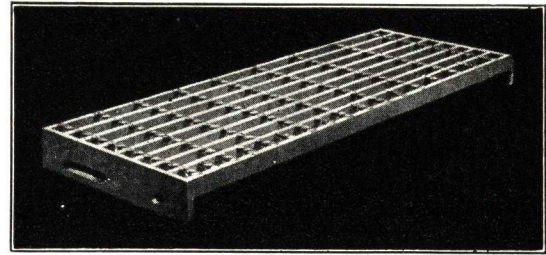
Blaw-Knox grating panels are 24 in. wide. Maximum length of panels 20 ft.

Lengths of stair treads furnished to suit your requirements.

Odd widths of panels as shown in table supplied to fill out necessary dimensions.

Standard cross-bar spacing 4 in. center to center. Spacings of 3, 2½, 2 and 1¾ in. can also be furnished.

Blaw-Knox Steel Steps



Blaw-Knox Steel Steps are made in accordance with the same principle as Blaw-Knox Electroformed Grating and with material having ⅝ or ¾-in. section. The outer edges are made doubly visible by means of an additional set of cross bars placed between the two outer bearing bars.

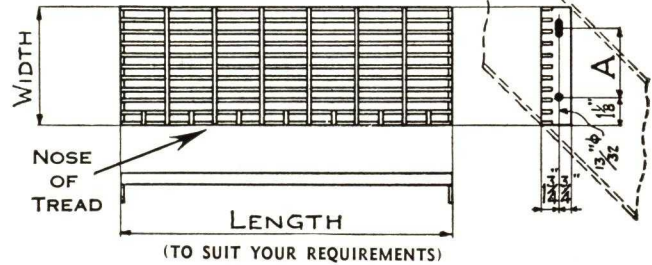


TABLE OF SAFE LOADS, BLAW-KNOX ELECTROFORMED GRATING—21 BARS (⅝-IN. SECTION)

"L" = Safe uniform load in lb. per sq. ft. Maximum allowable fiber stress 16,000 lb. per sq. in. "W" = Safe concentrated load in lb. per ft. of width. "C" = Deflection constant.

Type	Size of Bars	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"	Weight per Sq. Ft.
G21	⅝" x ⅝" Bars	L 581	373	259	189	145	114								5.92
		C .00017	.00042	.00087	.00161	.00276	.00438								
		W 581	466	388	331	290	256								
J21	1" x ⅝" Bars	L 1032	662	459	337	257	204	165	136	114					7.68
		C .00007	.00017	.00036	.00068	.00113	.00187	.00276	.00403	.0057					
		W 1032	827	689	590	515	458	413	375	343					
L21	1½" x ⅝" Bars	L 1612	1032	716	526	403	318	257	212	179	142	131			9.43
		C .00004	.00009	.00018	.00034	.00059	.00093	.00142	.00208	.00294	.00408	.00544			
		W 1612	1291	1075	921	805	715	644	584	538	494	459			
N21	1½" x ⅝" Bars	L 2321	1488	1031	758	580	458	371	307	251	219	189	145	114	11.18
		C .00002	.00005	.00011	.0002	.00034	.00054	.00083	.00121	.00173	.00236	.00313	.00406	.00515	
		W 2321	1863	1547	1327	1159	1030	926	844	772	712	662	621	581	
O21	1¾" x ⅝" Bars	L 3159	2024	1404	1032	790	624	505	417	351	298	257	197	155	12.94
		C .00001	.00003	.00007	.00013	.00021	.00034	.00053	.00077	.00109	.00149	.002	.0034	.00548	
		W 3159	2534	2105	1806	1580	1428	1263	1146	1053	969	901	838	788	
P21	2" x ⅝" Bars	L 4125	2642	1833	1348	1031	815	660	546	458	391	337	259	204	14.69
		C .000009	.00002	.00007	.00013	.00021	.00034	.00053	.00077	.00109	.00149	.002	.0034	.00548	
		W 4125	3306	2749	2358	2061	1867	1650	1500	1373	1269	1178	1034	916	
Q21	2¼" x ⅝" Bars	L 5220	3344	2319	1705	1305	1031	835	690	580	494	426	326	257	16.43
		C .000006	.00002	.00007	.00013	.00021	.00034	.00053	.00077	.00109	.00149	.002	.0034	.00548	
		W 5220	4180	3478	2984	2609	2319	2088	1896	1739	1605	1491	1302	1158	

TABLE OF SAFE LOADS, BLAW-KNOX ELECTROFORMED GRATING—21 BARS (⅝-IN. SECTION)

SPACING OF SUPPORTS

Type	Size of Bars	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"	Weight per Sq. Ft.	Type
8-G-21	¾" x ⅝" Bars	L 386	248	172	125	97	76								3.99	8-G-21
		C .00024	.00052	.00109	.00251	.00338	.00518									
		W 386	309	257	220	194	171									
8-J-21	1" x ⅝" Bars	L 688	440	305	225	172	135	110	90	76					5.10	8-J-21
		C .00009	.00024	.00047	.00081	.00141	.00221	.00338	.00438	.00697						
		W 688	550	457	351	343	305	275	249	228						
8-L-21	1¼" x ⅝" Bars	L 1075	689	477	350	268	212	172	142	119	101				6.21	8-L-21
		C .00005	.00016	.00029	.00046	.00077	.00115	.00173	.00265	.00359	.00461					
		W 1075	861	716	615	537	477	429	391	356	329					
8-N-21	1½" x ⅝" Bars	L 1548	996	688	505	387	306	248	205	172	146	125	97		7.34	8-N-21
		C .000032	.00007	.00017	.00028	.00044	.00067	.00103	.00156	.00201	.00294	.00384	.00578			
		W 1548	1244	1032	883	774	689	619	563	515	475	439	387			

Deflections: To obtain the deflection under any uniform load per square foot on a given span, multiply the load per square foot by the deflection constant "C" from the table for the given span. The result will be the deflection in inches at center of span under the actual load.

What to Specify When Ordering Blaw-Knox Electroformed Grating

1. Size of bars and type—standard or special.
2. Whether to be painted or galvanized.
3. Complete dimensions of area to be covered.
4. Direction bearing bars are to run.
5. Is clearance to be allowed?

WALTER BATES COMPANY, INC.

333 North Michigan Avenue, CHICAGO, ILL.

FACTORY AT GARY, IND.

BATES CROSSTRUSS GRATES

A Grating and Grating Floor System of Low Material and Production Cost

Lighter Weight—Greater Strength

Features

Strength: Unusually high strength—uniform, concentrated and spot concentrated.

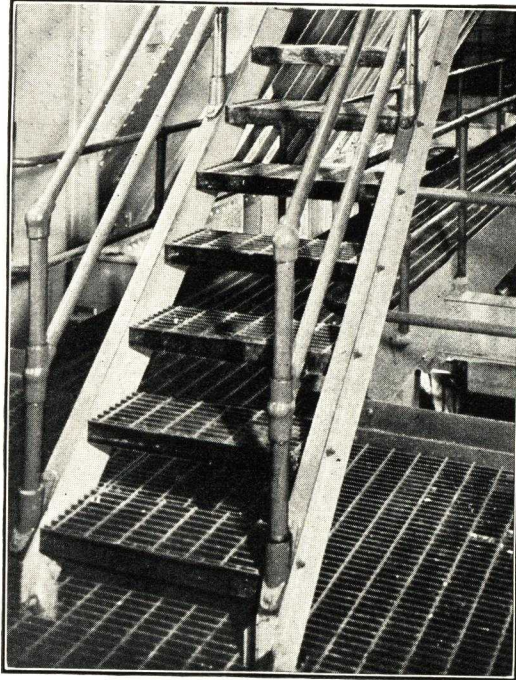
Light Weight: Relatively lighter in weight than other gratings of equal size and strength.

Reversible: May be used either side up—both sides are identical in appearance and strength.

Perfect Alignment: Attained by T-I-Beam and Holding Yoke construction at the joints. A smooth, even surface is assured and the tripping hazard is eliminated.

Spacing: Bars are spaced on unit basis—1.2 in. and 3.6 in. Single bar at joints.

No Banding: No banding is necessary because of the cross-truss strength.



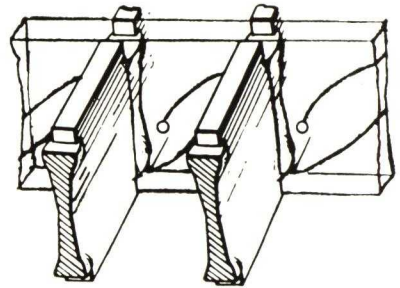
4-Way Traction: Main Bars and Crosstruss Bars at 90°.

Absolutely Firm: Firmness is secured by the T-I-Beam and Set Screws at the joints. Stair Treads are firm because of the cantilever action of crosstruss construction.

Appearance: Attractive in appearance as a floor surface or a ceiling because of perfect alignment and uniform width of all bars.

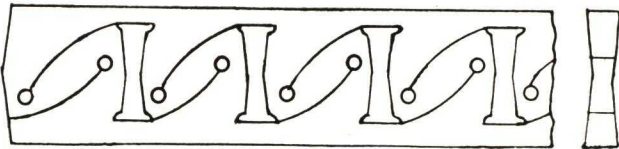
Construction

The same section is used for both main and crosstruss bars. This makes a uniform size of bar which reduces costs and greatly improves the appearance of the floor surface.



The main bars are indented top and bottom and the expanded crosstruss bar is then closed together and pressed and locked in the indentations.

A truss is thus created crosswise. Every main bar and every crosstruss bar carries part of every type of load. The ends of the crosstruss bars are supported on T-I-Beam Span Bars—an exclusive feature of Bates Crosstruss Grate floor construction.



Oblong or I-shaped holes are punched through the web of the bar, and curved shear cuts permit the expansion of the bar so that the main bars can be inserted.

TABLE OF SAFE LOADS—BATES CROSSTRUSS GRATES
Standard Grating Panels are 24 in. wide

Style No.	Depth of bars, in.	Weight per sq. ft., lb.	*Spot conc. load, lb.	L o a d	Width of Span													
					2'0"	2'6"	3'0"	3'6"	4'0"	4'6"	5'0"	5'6"	6'0"	7'0"	7'6"	8'0"	8'6"	9'0"
75	¾	5.0	585	W	647	467	369	310	272	246	224	183	154					
				D	100	156	225	306	400	506	625	* 756	900					
				C	647	584	553	542	554	554	560	503	462					
				T	625	625	625	625	795	795	970	970	970					
100	1	6.7	820	W	1094	774	600	495	427	381	347	308	260	221	191	166		
				D	1075	117	169	230	300	380	469	* 567	792	919	1,035	1,166		
				C	1094	969	900	867	855	859	847	780	718	668	623	588		
				T	625	625	625	625	795	970	1,225	1,225	1,225	1,225	1,225	1,225		
125	1¼	8.4	1055	W	1653	1153	881	717	611	538	448	392	333	287	250	220	195	174
				D	1060	094	135	184	240	304	375	* 540	633	735	844	960	1,084	1,215
				C	1653	1442	1321	1252	1222	1210	1216	1176	1082	1004	938	880	829	783
				T	625	625	625	625	795	970	1,225	2,050	2,050	2,050	2,050	2,050	2,050	2,050
150	1½	10.0	1290	W	2322	1602	1211	975	822	717	642	586	544	499	430	375	329	292
				D	1050	078	112	153	206	253	312	378	450	* 528	612	703	800	903
				C	2322	2000	1817	1709	1642	1611	1605	1610	1631	1622	1505	1406	1316	1241
				T	625	625	625	795	940	940	1,130	1,780	2,050	3,050	3,050	3,050	3,050	3,050
175	1¾	11.7	1525	W	3103	2123	1591	1270	1061	919	816	741	683	655	564	492	432	381
				D	043	067	096	131	171	217	268	324	386	* 453	525	603	686	774
				C	3103	2650	2485	2220	2125	2065	2040	2040	2050	2129	1974	1845	1728	1619
				T	625	625	795	970	1,225	1,225	1,780	2,750	3,050	4,250	4,250	4,250	4,250	4,250
200	2	13.4	1760	W	3995	2715	2020	1601	1329	1142	1009	910	835	777	730	643	565	501
				D	037	059	084	115	150	190	234	284	338	* 396	459	527	600	678
				C	3995	3400	3030	2800	2660	2570	2520	2500	2510	2520	2555	2411	2260	2129
				T	625	625	795	970	1,430	1,430	2,400	3,400	4,250	4,600	4,600	4,600	4,600	4,600
225	2¼	15.0	2000	W	4997	3378	2498	1967	1623	1387	1218	1093	998	924	865	821	722	639
				D	034	052	075	102	133	169	208	252	300	* 352	408	469	533	602
				C	4997	4220	3750	3440	3250	3120	3040	3000	2969	3020	3030	3078	2888	2715
				T	1,241	1,241	1,241	1,586	1,746	1,800	2,400	2,700	3,400	4,250	4,600	4,900	4,900	4,900

*Spot Concentrated Load applies to any span up to the asterisk. Beyond that point these loads decrease with other loads.
Strength: The great strength shown is obtained by the application of the load to the Crosstruss Bars as well as to the Main Bars. The T-I-Beam must be of correct strength to support the Crosstruss Bars so that they will deflect with the main bars. The T-I-Beam is an equalizer. On the short spans the majority of the load is on the main bars, as the spans increase the proportions change. This accounts for the peculiar changes in the concentrated and Spot Concentrated loads—they are right. The unusual strength of the Bates Crosstruss Grate is demonstrated by the fact that it is possible to use a ¾-in. Bates in place of the ordinary 1¼-in. grate in many places. This applies equally to all other sizes.

HENDRICK MANUFACTURING COMPANY

Mitco Interlocked Steel Grating, Armorgrids and Shur-Site Treads
55 Dundaff Street, CARBONDALE, PA.

SALES OFFICES AND REPRESENTATIVES

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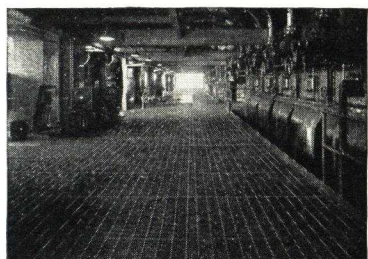
PHILADELPHIA, PA., Hendrick Manufacturing Company
PITTSBURGH, PA., Hendrick Manufacturing Company
ST. LOUIS, MO., Myron Glassberg
ST. PAUL, MINN., Hendrick Manufacturing Company
SALT LAKE CITY, UTAH., Steel Engineers Co.
SAN FRANCISCO, CAL., Price Building Specialties
SEATTLE, WASH., F. T. Crowe
TULSA, OKLA., Circle Corporation

Products

MITCO INTERLOCKED STEEL GRATING, MITCO ARMORGRIDS, and MITCO SHUR-SITE TREADS.

Also Perforated Metals, Perforated Metal Screens, Perforated Metal Grilles, Elevator Buckets, Testing Screens, Sheet Metal Work, Stacks, Tanks, Breechings and other Light and Heavy Steel Plate Construction in all metals and methods.

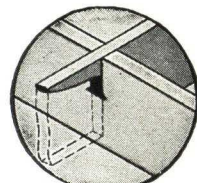
Mitco Interlocked Steel Grating



A view of part of the installation of over 70,000 square feet of Mitco Interlocked Steel Grating in a large steam generating station

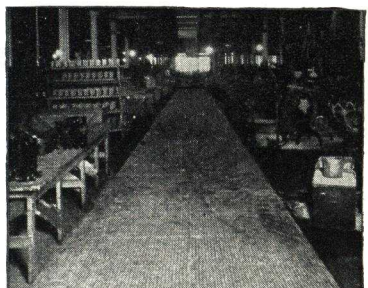
similar dirt-retaining, light-retarding features. 90% of the area of each Mitco panel is open area, thus giving maximum light and ventilation as well as preventing clogging of openings, and making painting and cleaning easy.

In addition, Mitco is non-slipping and imposes no difficulties for trucking traffic.



The method of locking the bars in Mitco panels utilizes in full-stress measure the maximum strength of the metal, and insures permanently-tight, integral-unit panels that never develop loosened or rattling bars

Mitco is furnished in a number of panel sizes, types and depths to fit openings of practically any size and shape. Upon receipt of an outline of the area to be covered, with indication of location of supports, Mitco engineers will gladly submit a suggested layout of Mitco Grating. Write for a copy of the Mitco Grating bulletin.



Main trucking aisle in the machine shop of a large manufacturer of automotive equipment, armored with Mitco Armorgrids



Mitco Armorgrids

Throughout industry, where floors, platforms, ramps and driveways are subject to severe service, Mitco Armorgrids have been effectively employed as flooring reinforcement, reducing cracking, wear and maintenance costs.

Mitco Armorgrids, coming in panel sizes to suit the job, are easily and quickly installed. They are simply laid on the rough base of the structure, leveled up, and the finishing fill of flooring material poured into the rectangular mesh. There is no fitting of the rods, no bolting, no assembly work of any kind. In structures protected by Mitco Armorgrids, their rail-like steel mesh absorbs the brunt of wear, shocks and abuse. Development of cracks, potholes and excessive wear is prevented. Write for bulletin on Mitco Armorgrids.

Mitco Shur-Site Treads

For stairs, ladders and fire escapes, Mitco Shur-Site Treads make light-weight, strong steps with traction and anti-slip qualities. A deep nosing bar, bent back at an angle under the front edge, clearly defines the front edge of every Mitco Tread. This safety feature prevents falls caused by over-stepping. The nosing bar is self-clearing, and has no pocket to collect snow, ice or refuse.

Mitco Treads are furnished in widths and lengths to meet all requirements, and come with carrier plates ready for attachment to stair stringers. Write for bulletin.



A view of part of the installation of Mitco Shur-Site Treads on a stairway in a modern coal pocket

Other Hendrick Products

Interesting bulletins and complete data on other Hendrick Products not catalogued here will be gladly sent you on request. Write us.

TABLE OF SAFE LOADS AND DEFLECTIONS FOR MITCO GRATING

SAFE LOADS IN POUNDS BASED ON FIBRE STRESS OF 16,000 POUNDS PER SQUARE INCH

Loads can be safely increased approximately 50% without permanent deformation or undesirable deflection

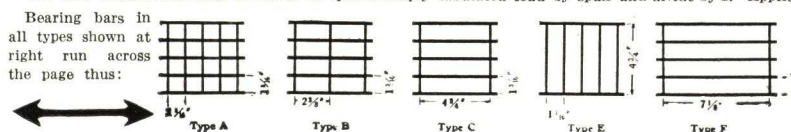
Depth and type	Bearing bars		Cross bars		Wgt. sq. ft.	Span in feet										
	Size inches	Spacing C to C	Size inches	Spacing C to C		2'0"	2'6"	3'0"	3'6"	4'0"	5'0"	6'0"	7'0"	8'0"	9'0"	10'0"
$\frac{3}{4}"$ C "D"	$\frac{3}{4} \times \frac{3}{16}$	$1\frac{3}{16}"$	$\frac{5}{8} \times \frac{1}{8}$	$4\frac{3}{4}"$	5.7	516 .088	331 .142	229 .198	169 .271	129 .353	82 .546	...	...	...	...	...
1" Lt. C "D"	1 x $\frac{1}{8}$	$1\frac{3}{16}"$	$\frac{3}{4} \times \frac{1}{8}$	$4\frac{3}{4}"$	5.4	611 .066	391 .104	271 .148	200 .203	153 .265	98 .415	...	...	...	...	...
1" C "D"	1 x $\frac{3}{16}$	$1\frac{3}{16}"$	$\frac{3}{4} \times \frac{1}{8}$	$4\frac{3}{4}"$	7.6	916 .066	587 .100	408 .148	300 .203	230 .265	147 .413	102 .596	...	...	...	...
$1\frac{1}{4}"$ C "D"	$1\frac{1}{4} \times \frac{3}{16}$	$1\frac{3}{16}"$	$\frac{5}{8} \times \frac{1}{8}$	$4\frac{3}{4}"$	9.4	1430 .052	915 .082	635 .118	467 .161	358 .211	229 .330	159 .475	117 .649	...	...	...
$1\frac{1}{2}"$ C "D"	$1\frac{1}{2} \times \frac{3}{16}$	$1\frac{3}{16}"$	1 x $\frac{1}{8}$	$4\frac{3}{4}"$	11.0	2062 .044	1320 .069	916 .099	673 .135	516 .177	331 .277	229 .398	168 .540	129 .707	102 .898	...
$1\frac{3}{4}"$ C "D"	$1\frac{3}{4} \times \frac{3}{16}$	$1\frac{3}{16}"$	1 x $\frac{1}{8}$	$4\frac{3}{4}"$	12.8	2810 .037	1800 .059	1248 .098	916 .115	703 .151	450 .236	312 .341	230 .465	168 .603	136 .770	112 .946
2" C "D"	2 x $\frac{3}{16}$	$1\frac{3}{16}"$	1 x $\frac{1}{8}$	$4\frac{3}{4}"$	14.5	3670 .033	2345 .051	1630 .074	1198 .100	916 .132	587 .207	407 .299	300 .406	229 .525	181 .687	147 .829
$2\frac{1}{4}"$ C "D"	$2\frac{1}{4} \times \frac{3}{16}$	$1\frac{3}{16}"$	1 x $\frac{1}{8}$	$4\frac{3}{4}"$	16.1	4650 .029	2970 .046	2070 .066	1517 .090	1162 .118	744 .151	517 .266	362 .480	291 .672	230 .794	186 .933

MITCO DRIVEWAY GRATINGS (For Heavy Traffic, Coal "Grizzlies," Etc.)

$2\frac{1}{4}"$ C	$2\frac{1}{4} \times \frac{3}{8}$	$1\frac{1}{2}"$	$2 \times \frac{1}{2}$	$4\frac{3}{4}"$	36.8	8440	5400	3750	2760	2100	1350	940	690	528	416	338
$2\frac{3}{4}"$ C	$2\frac{3}{4} \times \frac{3}{8}$	$1\frac{1}{2}"$	$2\frac{1}{4} \times \frac{1}{2}$	$4\frac{3}{4}"$	44.6	13900	8880	5640	4530	3470	2220	1540	1130	865	685	555
$3\frac{1}{4}"$ C	$3\frac{1}{4} \times \frac{3}{8}$	$1\frac{1}{2}"$	$2\frac{1}{4} \times \frac{1}{2}$	$4\frac{3}{4}"$	51.7	...	12400	7850	6310	4840	3100	2150	1580	1210	955	775
$3\frac{3}{4}"$ C	$3\frac{3}{4} \times \frac{3}{8}$	$1\frac{1}{2}"$	$2\frac{1}{4} \times \frac{1}{2}$	$4\frac{3}{4}"$	58.7	...	16500	10470	8410	6440	4120	2862	2100	1610	1272	1031

"D"—Deflection in inches for uniform live load. Types C and E have same deflection for same spans. Driveway can also be furnished in Type B having same strength as Type C and weighing approximately six lbs. per sq. ft. more. For safe concentrated load at center of span multiply tabulated load by span and divide by 2. Applies to both tables above.

Bearing bars in all types shown at right run across the page thus:



Types A, B, C and F have the same strength for the same size bearing bars.

Type E has only one-fourth the strength of Type A, B, C and F.

KERLOW STEEL FLOORING COMPANY

Steel Grating Flooring, Steel Grating Steps, Steel Bridge, Highway and Floor Paving

TELEPHONES
BErgen 3-8932-33-34

222-238 Culver Avenue, JERSEY CITY, N. J.

REPRESENTED IN ALL PRINCIPAL CITIES

Products

KERLOW STEEL FLOORING (both Reticulated and Rectangular Designs) for: Industrial and Marine Gratings and Safety Steps; Tank, Freight, Refrigerator and Passenger Car Gratings; Ice and Coal Bunker Gratings; Dry Kiln Floors and Racks; Motor Truck Radiator Guards; Heavy Duty Manhole Covers; Steel Tower Platforms; Plate Floors and Steel Construction.

KERLOW BRIDGE and FLOOR SLAB.

Kerlow Bridge and Floor Slab

Some of the many advantages of the Kerlow (Series M) Bridge and Floor Slab are:

(1) Increased strength, life, and decreased weight for given loadings.

(2) The Kerlow design approximates that of a true beam, with its neutral axis at its center. This design, being flexible, can be easily modified as to width, length, and thickness.

(3) The Kerlow design provides its own form for the pouring of concrete into the slabs. No accessory forms of any kind are necessary, and therefore there are no forms to be removed after the concrete has set.

(4) The Kerlow Bridge and Floor Slab as fabricated can be used by the hand trucks used in pouring cement.

(5) With the Kerlow Slab, the workmen will be safe, as the bridge and floor units can be installed as soon as the supporting floor beams or stringers are in place.

(6) Inasmuch as there are no forms to be built nor forms to be removed, greater speed is permitted in the construction of the project, and therefore the total costs are greatly reduced.

(7) The Kerlow Bridge and Floor Slab is non-slipping, crack and fireproof. Specify Kerlow (Series M) Bridge and Floor Slabs. Comprehensive data upon request.

Kerlow Steel Grating Flooring

A superior floor, fireproof, ventilating and comfortable to walk and work upon. This superiority is due to the following factors, i. e., economy (the first cost is less, and the last), long life (outlasts floors of other materials), strong (metal bars on edge permanently and closely united), clean (self-cleansing, need not be swept), and safe (slip-proof in all directions).

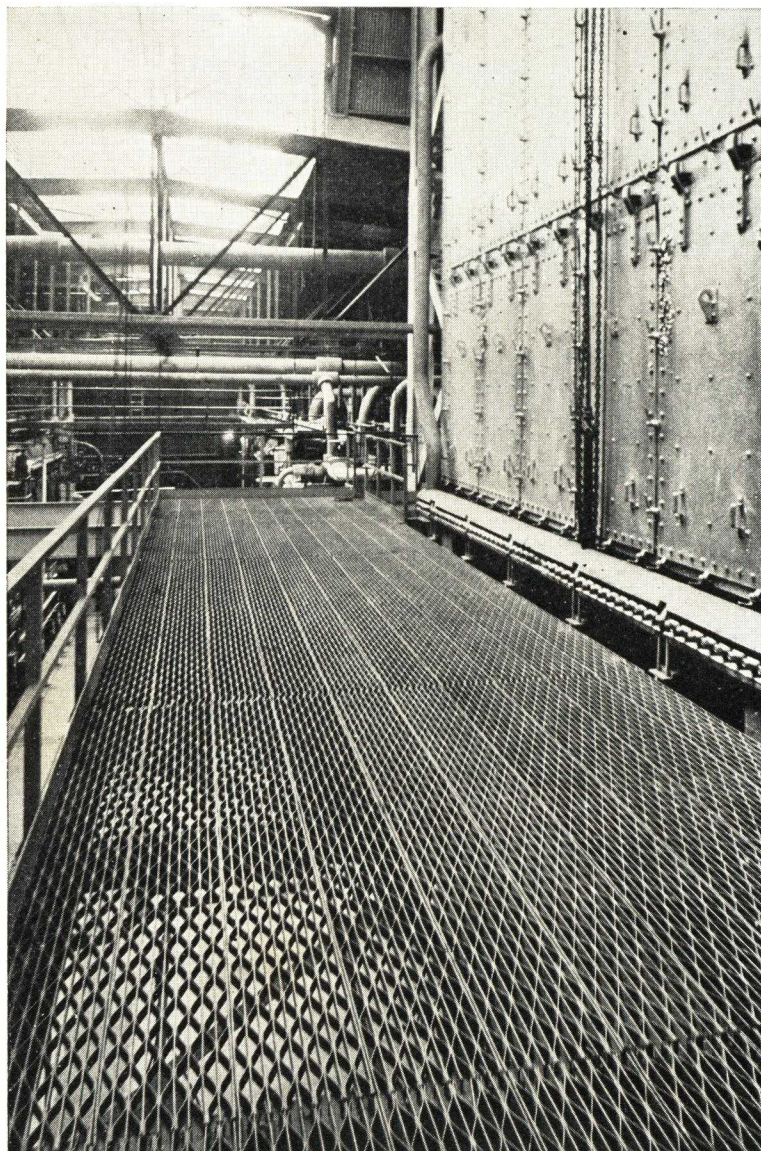
There are two general kinds of Kerlow Floors, Series V (reticulated in design), having triangular openings, and Series F (rectangular in design, having rectangular openings).

Kerlow
Steel Floors
(TRADE-MARK)

Kerlow Steel Grating Steps

A strong, light, sanitary industrial stair and ladder tread. A rectangular section of Kerlow Open Flooring—provided with an oversize impact nosing bar and with the Kerlow (patented) Stair Step Carrier at each end. These step carriers are so designed, that the step can be bolted to the stair stringers, despite variations in the stringer hole spacing.

These steps are made to fit any and all stair conditions. Submit step size and quantities for prices.



Kerlow Grating Type V7 in Large Power Station

INLAND STEEL COMPANY

4-Way Rolled Steel Floor Plate

38 South Dearborn Street
CHICAGO, ILL.

ST. LOUIS, MO.

ST. PAUL, MINN.

DISTRICT OFFICES
DETROIT, MICH.

MILWAUKEE, WIS.

KANSAS CITY, MO.

Products

4-WAY FLOOR PLATES.

Steel Sheets, Strip, Plates, Bands, Structural, Bars, Rivets, Sheet Piling.

(For superior corrosion resistance all products can be furnished in Inland Copper Alloy Steel.)



laid side to end, end to end, or side to side. Thus there is no cost penalty to securing the neatness of a continuous pattern on the whole floor. Even small pieces are useful. An economy both in laying and stocking.

Extra Stiff

Projections overlap equally *both* lengthwise and crosswise. Hence Inland 4-Way Plate is equally stiff along *both* dimensions. Yet it can be bent or formed to any desired shape.

Lighter Per Square Foot

Inland 4-Way Floor Plate offers another economy. It is lighter in weight per square foot—yet the overlapping of projections makes it additionally strong and stiff per given gage.

Ready Drainage—Easy Sweeping

Convenient cleanliness is an important factor in safety on many applications. Inland 4-Way Plate sweeps clean in any direction convenient—and it drains easily.

4-Way Floor Plate

Inland 4-Way Floor Plate (Pat. App. for) combines the strength and wear-resisting qualities of rolled steel with several other advantages—some of them exclusive. For stairs, walkways, floors, platforms, any application where sure-footed traction, economy, and long wear under heavy loads are factors, it deserves thorough consideration.

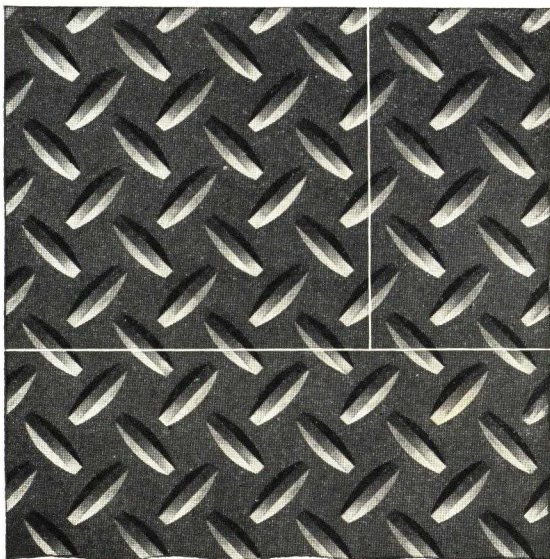
4-Way Safety

Safety is always vital. Here Inland 4-Way Plate is superior because it provides equal foot-traction in all four directions. This is because the projections center one another at right angles—an exclusive feature.

Projections are so designed that the centers are slightly higher. Set comparatively far apart, the result is that the foot rests on traction points. And the edges of the projections are angles—increasing traction.

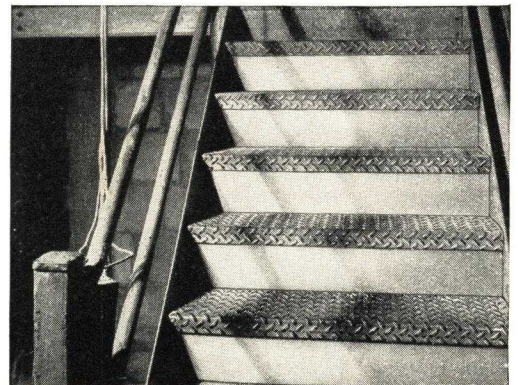
4-Way Matching

Another exclusive advantage due to the exclusive Inland 4-Way pattern is economy in matching. The accompanying cut shows how plates match whether



Showing How Inland 4-Way Floor Plate Matches Without Waste Whether Plates Are Laid Side to End, Side to Side, or End to End

View of the Stairway in the New 42-story Field Building, Chicago. Four Flights of Stairs Were Fabricated from Inland 4-Way Floor Plate. Safe, Economical



Sizes

Made in Small Pattern and Large Pattern. Small Pattern from 12 gage to $\frac{3}{16}$ in. (Projections 1 in. long.) Large Pattern from $\frac{3}{16}$ in. to $1\frac{1}{4}$ in. (Projections $1\frac{1}{4}$ in. long.) Width up to 72 in. Length up to 50 ft.

Other Inland Products

Inland produces a comprehensive line of Open Hearth Rolled Steel Products, including sheet piling, many of which are also available rolled from Inland Copper-Alloy Steel.

Copper-bearing steel has been proved superior for rust and corrosion resistance by unbiased scientific tests and is recommended for all such applications. Literature will be sent on request.

ACME STEEL COMPANY

Manufacturers of Acme Floor-Steel for Industrial Floors
2839 Archer Avenue, CHICAGO, ILL.

BRANCHES

BROOKLYN, N. Y., 219 36th Street
ATLANTA, GA., 603 Stewart Avenue, S. W.
NEW ORLEANS, LA., 518 Gravier Street

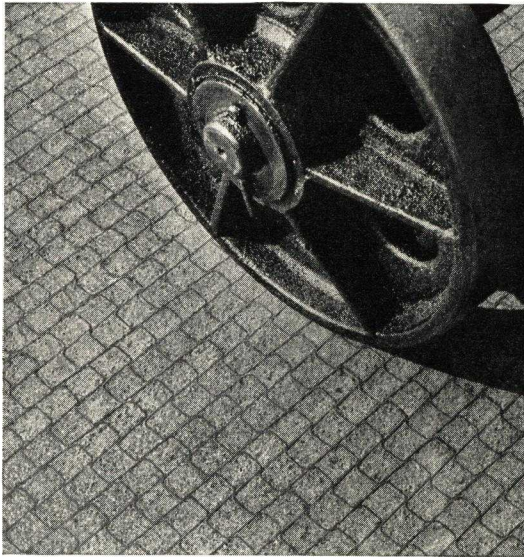
MONTREAL, QUE., 365 St. Paul Street, W.
WINNIPEG, MAN., MacArthur Bldg.
TORONTO, ONT., 32 Front Street, W.

LOS ANGELES, CAL., 300 Avery Street
SAN FRANCISCO, CAL., 200 Davis Street
SEATTLE, WASH., 114 Railroad Avenue, S.

ACME FLOOR-STEEL

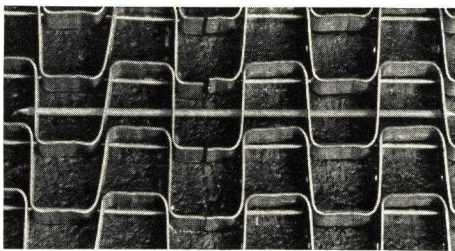
FOR LONG LIFE INDUSTRIAL FLOORS

U. S. Patent No. 1,432,171, Oct. 17, 1922. Other Patents Pending.
Canadian Patents No. 303,151, Aug. 19, 1930; No. 303,152, Aug. 19, 1930



Acme Floor-Steel

Embedded flush with the top in concrete and asphalt floors, Acme Floor-Steel literally provides a network of steel rails for truck wheels. Two or more of these rails are at all times supporting each wheel. The small mesh in combination with the light section of cold rolled steel makes a permanently smooth and quiet floor. Under the heaviest trucking the exposed edges of the steel ribs become slightly mushroomed, presenting an increased area of steel in the surface. This protects the material next to the rib and prevents shattering.



Acme Floor-Steel is delivered on the job in easily handled rolls containing one piece 47 1/2 in. wide by 25 ft. long, or in special widths where necessary, varying by units of 2 1/2 ins. Manufactured of Cold Rolled Strip Steel .048 inch thick. Size of mesh is 1 1/4 x 1 1/4 ins.—depth 5/8 in.

For the Surface Reinforcement of New or Old Floors and Truckways

It is used in concrete or asphalt mastics, also over concrete, wood or steel filled with cold mastic, hot mastic or other suitable material.

The outstanding success of Acme Floor-Steel is due to the small mesh and light section of steel.

Acme Floor-Steel Advantages

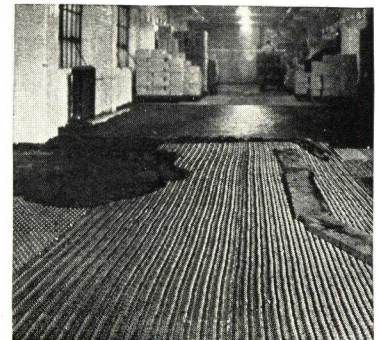
- (1) A flexible grid that is easy to lay.
- (2) Presents a quiet, non-skid surface.
- (3) The exposed steel edges bear the load.
- (4) Cracks, holes and ruts cannot develop.
- (5) Remains smooth and even through life.
- (6) Maintenance is practically eliminated.

Repairing Old Floors

Repairing an old floor is a simple matter with Acme Floor-Steel.

When used over old concrete or brick, the floors should be previously prepared by filling holes, uneven worn spots and cracks with a suitable grout. An asphalt bond coat is applied, and the Acme Floor-Steel laid in the usual manner with mastic used for the filling material.

When used over wood, after the worn maple wearing floor has been removed, the laying of Acme Floor-Steel should be done with the operations above described. In addition, the Floor-Steel should be fastened to the base by means of Acme Floor-Steel Anchors provided for this purpose.



Left:

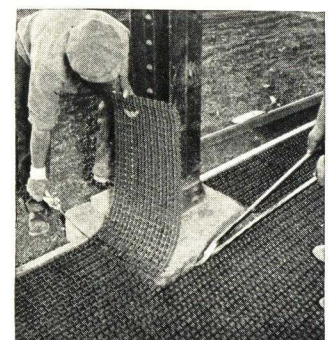
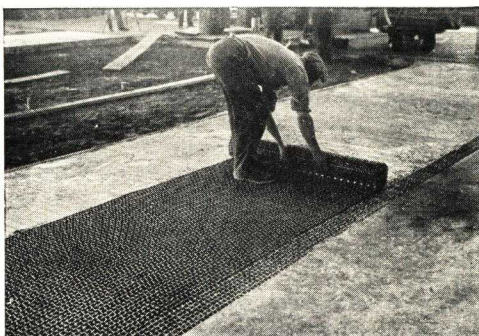
Laying

Acme Floor-Steel is rolled out on the base course or sub-floor in large sections which are joined by pins and wires into one continuous mat. Filling material is then placed and troweled. As an alternative Floor-Steel may be pressed or tamped into surface after floor has been struck off at finish line.

Right:

Fitting

Fitting Acme Floor-Steel around an obstruction is easily and quickly done by cutting the steel on one side and pulling two wires.



BLAW-KNOX COMPANY

Manufacturers of Floorgard—Steel Armoring for Concrete Floors and Pavements
2074 Farmers Bank Building, PITTSBURGH, PA.

For Sales Offices, see Steel Grating Pages
For Other Products, see Manufacturers' Index

Floorgard—Steel Armoring for Concrete Floors and Pavements

Floorgard or Blaw-Knox floor armoring is a strengthening and protecting mat of steel mesh, put together easily, quickly and cheaply, without the use of tools, reinforcing the surface of the floor by taking the entire wear, and furnishing a really satisfactory surface which will last indefinitely.

Floorgard is made up of steel strips carefully formed into a regular pattern, which when placed together, form a series of separate rectangles of proper size to meet the conditions under which a given floor must work. These steel strips are set on edge as shown in accompanying illustrations. Small, short, circular tie rods are inserted in a horizontal position, through holes in the middle of the strips. These tie rods act as carrying members carrying one strip to another strip, as well as tying the entire structure into one steel mat.



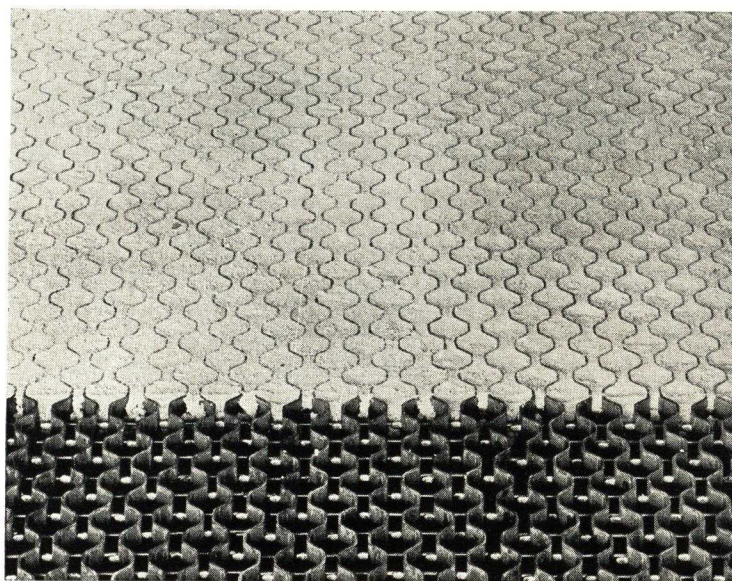
floor laid out in steel squares, but so arranged that pressure or impact applied to one square is transmitted to all surrounding parts of the floor. There is no question of individual weakness or of little individual blocks of concrete in any part of a Blaw-Knox Floor, because when the Floorgard is filled, the floor is monolithic in character and each square or rectangle is part and parcel of the entire floor body.

In addition, the concrete is reinforced and securely anchored to the armoring by the horizontal rods passing through the steel strips.

No Tools—No Drawings Required—

The construction is of such a nature that it can be formed to meet any possible floor requirement. It will be noted in the illustration that there are small steel lugs between adjacent strips of Floorgard at the points where the tie rods go through the steel strips. These lugs act as anchors to keep the steel strips in the plastic material, and also as separators be-

tween the strips avoiding any possibility of rust due to contact of steel. There are no acute angles to cause the formation of thin, easily broken fins of concrete.



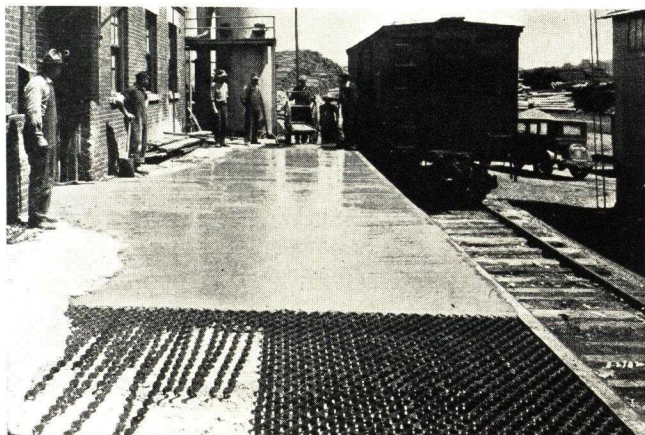
Floorgard Partly Concreted—Used in Reflooring a Modern Factory

Floorgard Makes a Smooth and True Surface—An industrial floor armored with Blaw-Knox Floorgard has a smooth and true surface. The entire area of steel mesh is one unbroken unit, perfectly level at all points, making one of the strongest and best industrial floors ever developed.

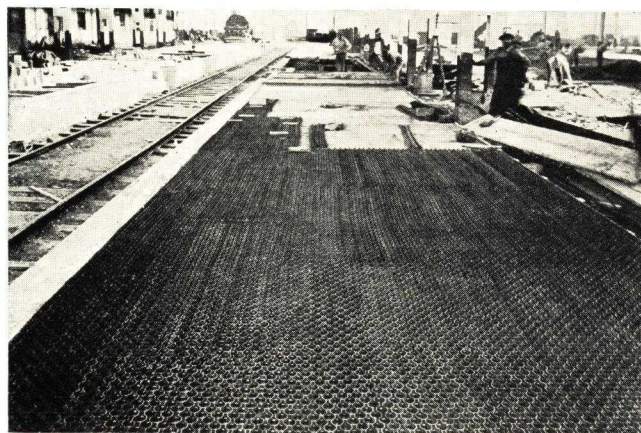
It must be realized that Blaw-Knox Floorgard is not a system for reinforcing concrete, but is actually a means for making a floor having all the wearing qualities of steel, plus the smoothness, elasticity, resiliency and foot ease of softer materials. Here we have a

Pavegard (Flooring for Pavements)

Pavegard is another name identifying Blaw-Knox steel armoring with its use in connection with strengthening roads, streets, alleys, courtyards, bridges, bridge approaches and other forms of pavement which are ordinarily subject to extremely heavy wear.



Typical Blaw-Knox Floorgard Installation



Blaw-Knox Floorgard—Steel Backbone

SNEAD & COMPANY

Self-anchoring ArmorGrids for Concrete and Asphalt Floors (Snead Patents)

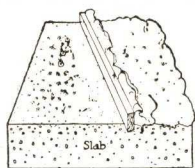
TELEPHONE
Montgomery 5-6200

92 Pine Street, JERSEY CITY, N. J.

Snead ArmorGrids Meet the Following Industrial Requirements

- 1—Permanent—Non-dusting—Quiet
- 2—Offer Minimum Resistance to Traffic
- 3—Afford Good Traction Under All Conditions
- 4—Protect Concrete or Mastic
- 5—Withstand Shocks
- 6—Impervious to Acid, Moisture, Temperature Changes
- 7—Good Appearance and Easy to Clean
- 8—Inexpensive to Install and Maintain

How to Install in Concrete



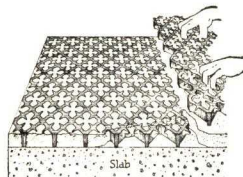
First

Screed off slab to true level surface, exact depth of grid below finished floor level



Second

When slab or leveling coat has partially set, flow on surface coat of rich 1:2 mix made with fine sharp sand



Third

Press grids into surface coat matching pattern and allowing $\frac{1}{8}$ -in. clearance between grids. Bottom grids firmly on slab



Fourth

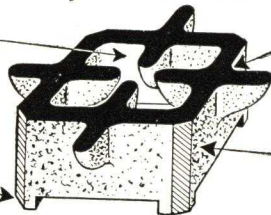
Screed off excess grout, float in thoroughly to fill all voids and trowel smooth. Finished grout should be flush with, or about $\frac{1}{8}$ in. higher than, top surface of grid

Note: Any grid can be shaped for odd-dimensioned areas, drains, etc., with a hack saw, cold chisel and hammer.

5 Superior Features

Small symmetrical openings permit rolling and sliding traffic in all directions, without wearing out floor material

Pedestals provide automatic means of leveling, and allow floor material to flow under and interconnect all pockets



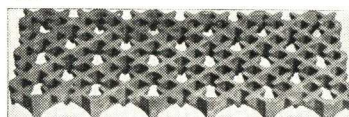
All corners rounded. No acute angles. No thin fins to break

Projecting ribs hold down floor material and prevent spreading

Roughened and tapered side walls bond perfectly with floor material without special anchoring devices



No. 10 Lightweight Armor



No. 30 Heavy Duty Armor

ArmorGrids Eliminate Floor Repairs

Under grinding truck wheels, banging boxes and trunks, rolling barrels and milk cans, the dropping of heavy castings and severe traffic conditions of every sort, the best floor surfaces are in need of constant repairs, which are expensive and necessitate costly delays to production.

Snead ArmorGrids eliminate the floor repair problem. Set in cement or asphalt, they armor the floor, carry the load and receive the shocks. They have been in wide use over 20 years, and during this time no installation of Snead grids ever had to be renewed, even under the hardest service.

Snead ArmorGrids do not break, work loose or wear slippery. They bond perfectly with the floor mass, hold it down and keep it intact. They distribute heat strains and keep asphalt from flowing. They prevent spalling and dusting of concrete. Pedestals are provided on the under side of each grid to expedite setting and to raise the ribs off the slab, thus permitting the finish grout to flow under the ribs and interconnect all pockets. They present a smooth running surface and they wear indefinitely.

Specification for Installing Over Concrete Base

Base shall be brought to a true and even surface exactly the depth of the grid below the finished floor level. When the slab has set enough to hold the weight of the grids flow on a surface coat of rich 1:2 mix using clean, sharp sand; press the grids into the mix until they rest firmly on the slab. (Specify whether grids shall be laid in straight rows or staggered or laid herringbone). Grids shall be pressed into the surface coat until the mix squeezes through the openings at the top; excess grout shall be screeded off and given a trowel finish, leaving the concrete flush or about $\frac{1}{8}$ in. higher than the iron.

Specification for Installing in Asphalt Over Concrete

Prepare base slab as described above. Then apply a hot mix of asphalt mastic not less than 350° F. with no particles of aggregate over $\frac{1}{4}$ in. in diameter. Grids shall be pressed into the asphalt mastic until they rest firmly on the slab. Asphalt shall be brought $\frac{1}{8}$ or $\frac{1}{4}$ in. over grids and a second rubbing shall be given after filling with clean, sharp sand.

Specification for Installing in Asphalt Over Wood Floors

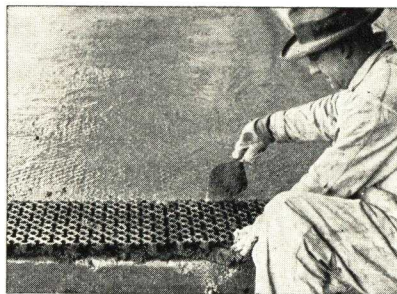
Floor boards shall be laid close and securely nailed to bearings, which should not be over 16 in. on centers. All loose knots and knot holes shall be covered with sheet metal. Over this lay two thicknesses of waterproof felt. Then proceed as described in preceding paragraph.

Right:

3350 sq. ft. No. 20 Snead ARMORGRID—Chas. R. Hedden Co., Newark, N. J., Contractor—installed in March 1929 for Merchants Refrigerating Co., Jersey City, N. J.

After testing many floor materials, No. 20 Snead Grids were selected as most economical per foot, per year, by the owner of this railroad platform, one of the largest refrigerating companies in the country.

All of this company's plants now have Snead Grid protection



A FEW OF MANY USERS

Automobile Manufacturers

Buick Motor Car Co.
Durant Motor Co.
Ford Motor Co.
Mack International Motor Truck Co.

Pierce Arrow Motor Car Co.

Chemical Industries

Colgate & Co.
Electric Storage Battery Co.
Solvay Process Co.
The Viscose Co.

Dairies and Cold Storage Plants

Borden's Farm Products Co.
Brown-Bailey Condensed Milk Co.

Consumers Dairy Co.
Dairy Maid Ice Cream Co.
Dairymen's League Cooperative Assn.

Eastern Cold Storage Co.

Furnas-Velvet Ice Cream Co.

J. M. Horton Ice Cream Co.

Hosler Ice Cream Co.

Merchants Refrigerating Co.

National Cold Storage Co.

Reid Ice Cream Co.

M. H. Renken Dairy Co.

Sheffield Farms Co.

Walker Gordon Laboratories

Food Products

Armour & Co.

Corn Products Refining Co.

General Baking Co.

Geo. A. Hormel & Co.

C. F. Mueller (Macaroni)

Runkel Bros.

Schaeffer Brewing Co.

Standard Brands, Inc.

Wm. Wrigley, Jr.

Hardware and Metal Products

American Cable Co.

American Can Co.

American Hardware Corporation

Brown & Sharpe Mfg. Co.

Continental Can Co.

General Electric Co.

Hyatt Roller Bearing Co.

Irrington Smelting & Refining Co.

National Lead Co.

Rundle Mfg. Co.

Scoville Mfg. Co.

A. Schrader's Sons Inc.

U. S. Government Mint

Yale & Towne

Paper, Printing, Publishing

Art Gravure Corp.

Detroit Sulphite & Paper Co.

Doubleday, Page & Co.

Nelson, Doubleday, Inc.

New York World-Telegram

Oxford Paper Co.

West Virginia Pulp & Paper Co.

Railroads, Public Service, Etc.

N. Y. Central R. R.

Brooklyn-Manhattan Transit Co.

Brooklyn Union Gas Co.

George Washington Bridge

Pennsylvania Hotel (Service Department)

Pennsylvania R. R.

U. S. Govt. Post Office, N. Y.

Rubber Products

Globe Cork & Insulating Co.

B. F. Goodrich Rubber Co.

Goodyear Rubber Insulating Co.

Armstrong Cork & Insulating Co.

Manhattan Rubber Co.

Warehouses, Etc.

Frederick Loeser & Co.

H. W. Johns-Manville Co.

Port of New York Authority

DIMENSIONS, WEIGHTS AND DISPLACEMENT

Grid No.	Length, in.	Width, in.	Rib depth, in.	Over-all depth, in.	Rib thickness, surface, in.	Rib spacing, ctr. to ctr., in.	Area, sq. ft.	Effective armor, % total area	Openings, in.	Weight approx., lb.	Finished aggregate displaced, %
10 Lightweight	24	12	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{1}{4}$	$2\frac{1}{2}$	2	41	$\frac{3}{4}$	10	21
20 General purpose	24	12	1	$1\frac{1}{4}$	$\frac{1}{4}$	$2\frac{1}{2}$	2	41	$\frac{3}{4}$	20	21
30 Heavy duty	24	12	$1\frac{1}{4}$	$1\frac{3}{4}$	$\frac{3}{8}$	$2\frac{3}{4}$	2	41	1	30	21

ESTABLISHED 1846

CORNELL IRON WORKS, INC.

Rolling Steel Doors, Float-over Doors, Rolling Grilles, Rolling Shutters

TELEPHONE
Stillwell 4-3880

3700 13th Street, LONG ISLAND CITY, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

Products

CORNELL ROLLING DOORS in Steel, Bronze, Aluminum, Stainless Steel or with Cornell Non-corroding Curtain Bottoms.

UNDERWRITERS' LABELED ROLLING FIRE DOORS.

FLOAT-OVER DOORS in galvanized tubular steel.

FLOAT-OVER DOORS in wood, Deep Panel or Standard types.

ROLLING GRILLES and GATES in steel or other metals.

Electric Motor Drives for all above products.

Cornell Rolling Doors

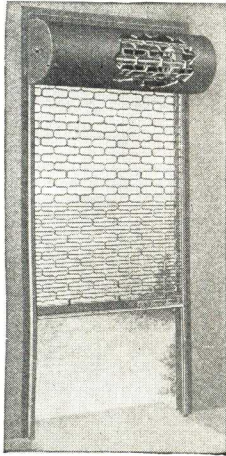
Cornell Steel Rolling Doors are designed for the closure of all types of openings offering fire, burglar and weather protection and combining neat appearance with economy of space. Made of steel, bronze, etc., or with exclusive Cornell non-corroding curtain bottoms.

The curtain consists of a series of interlocking sections; stiff against pressure, but flexible to coil. It runs in vertical side guides and coils around a horizontal shaft above the opening. The weight of the curtain is counterbalanced by springs in the shaft.

Size offers no problem. Cornell Rolling Doors and Shutters are made up to 45 ft. wide and 100 ft. high; constructed to meet requirements.

Underwriters' Labeled

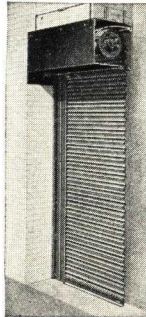
Cornell (Llenroc) Rolling Fire Doors, which automatically close in case of fire, are tested and labeled by Underwriters' Laboratories, Inc. Also approved by Factory Mutual Laboratories.



Cornell Rolling Grille

Cornell Rolling Grilles and Gates

Constructed on the principle of Cornell Rolling Doors. Used in all openings and in front of show windows, etc. Give protection against theft and damage but admit light, air and vision.



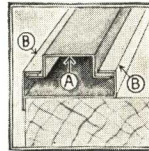
Underwriters' Labeled Llenroc Fire Door

Free Service

Catalogs and photos of all products sent free. Dimension drawings and the services of our Engineering Department are always available.



SCIENTIFICALLY designed to withstand wind pressure and to limit deflection to 1/4 in. per foot of width. Light as wood, floating overhead with lifting ease. Flush, Standard, and Molded types shown at right. Cornell Deep Panel Wood Doors are 2 3/4 in. thick—four times as strong yet no heavier or more costly than 1 3/4-in. standard doors. Standard Wood Doors carried in stock for opening 8 ft. x 7 ft.; 8 ft. x 7 ft. 6 in. and 8 ft. x 8 ft.; six panels wide and four sections high, top section for glass.



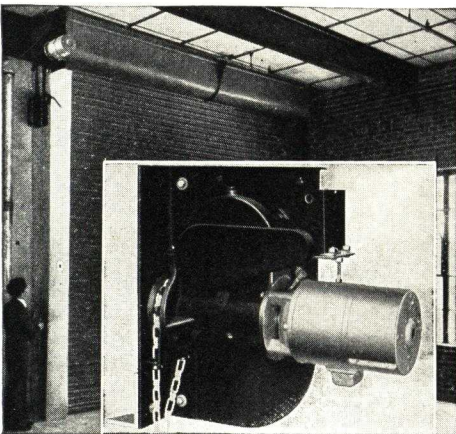
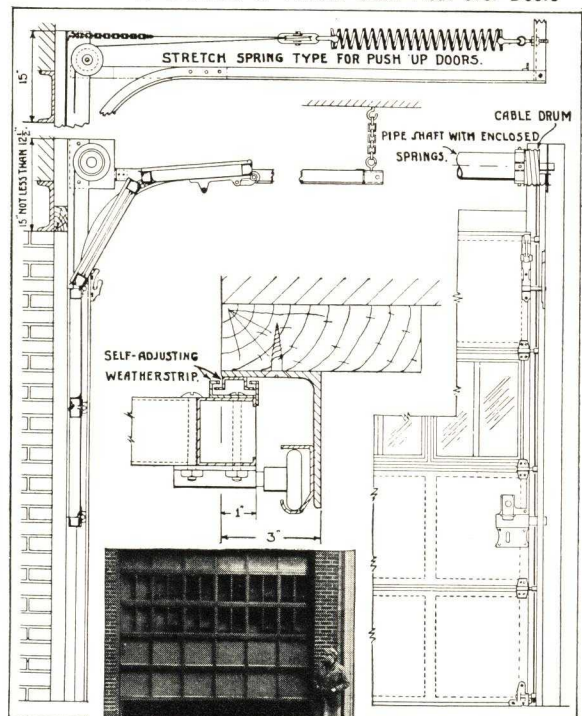
Left and upper left:

Feather-touch Weatherstrip

Confoundedly simple and certain action. Spring forces "A" against jamb sealing any gap or crack against cold air, wind or weather. Each panel independently self-adjusting.

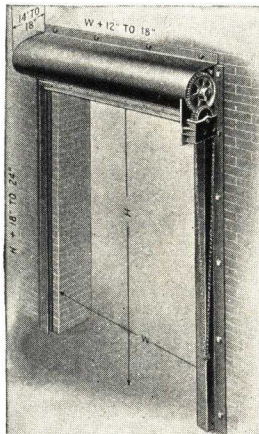
Below:

Details of Construction of Tubular Steel Float-over Doors



Cornell New Motor Drive

Note the clean, compact, self-contained unit. Electric brake, automatic limit switch, and emergency hand chain operator disengageable from floor if required. Remote control by push buttons



Type CGF Chain and Gear Door

Standard for openings over 80 sq. ft. Note dimensions

THE J. G. WILSON CORPORATION

GENERAL OFFICES
11 East 38th Street
NEW YORK, N. Y.

FACTORIES
P. O. Box 1194
NORFOLK, VA.

OFFICES IN ALL PRINCIPAL CITIES

Products

WILSON COMMERCIAL ROLLING STEEL DOORS.
WILSON UNDERWRITERS' LABELED STEEL DOORS.

WILSON SECTIONFOLD DOORS OPERATING OVERHEAD.

All Wilson Rolling Doors are made of open hearth or copper bearing steel, electrogalvanized.



TRADE-MARK

Where Used

Warehouses, Factories, Garages, Breweries, Car Barns, Freight Stations, Piers, Terminals, etc.

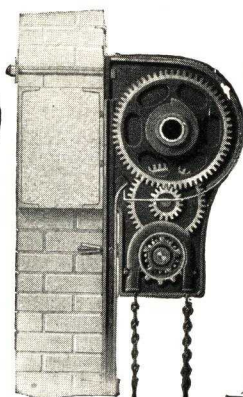
Commercial Rolling Doors are made of No. 22, 20, 18 and 16 U. S. Standard Gauges. Underwriters' Labeled Rolling Doors are of No. 20 Gauge.

TYPES, CLEARANCES AND GROOVES FOR COMMERCIAL ROLLING DOORS



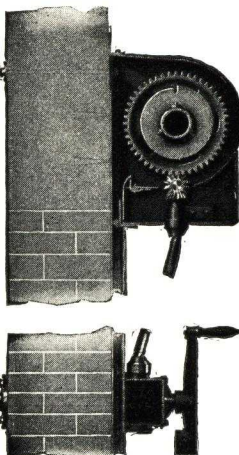
Self-Coiling,
Type S.C. 11

Doors are raised and lowered by handles on the bottom bar. Adapted to doors 8x10 ft. or less



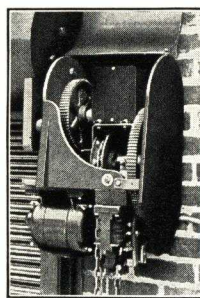
Chain-Gearing,
Type C.G. 11

Usually used on doors over 8x10 ft. and up to 300 sq. ft. Gearing is simple or compound depending on size and weight of door. All parts are easily accessible for lubrication



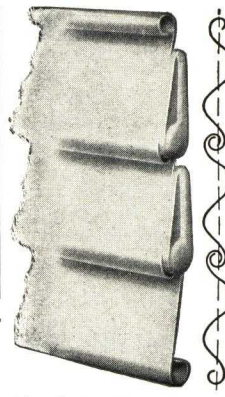
Crank-Gearing,
Type K.G. 11

Used where operation on both sides of wall is desired

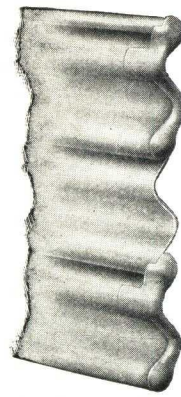


Wilson Motor Unit for
Small or Large Doors

Equipped with push-button control, limit switch, Thermo Overload Relay, solenoid brake, and emergency hand chain



No. 2 Interlocking
Slat with Fire
Stops



Big 4 Interlocking
Slat

Coils and Grooves can be placed either on face of wall or between jambs

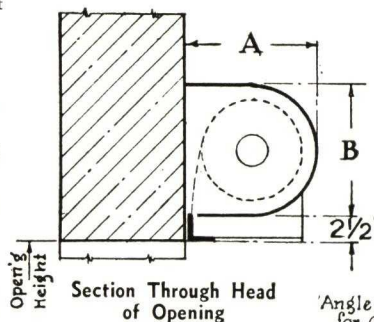
CLEARANCE SCHEDULE FOR COMMERCIAL ROLLING STEEL DOORS

SELF-COILING TYPES

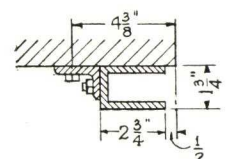
Type SC-11				Type SC-22			
Opening height	A, in.	B, in.		Opening height	A, in.	B, in.	
Little No. 4 Slat				Little No. 4 Slat			
3'10" to 4'8"	12	12½		5'1" to 6'0"	12	12½	
4' 9" to 7'1"	13	13½		6'1" to 8'6"	13	13½	
7' 2" to 10'0"	14	14½		8'7" to 11'6"	14	14½	
	15	15½			15	15½	

CHAIN OR CRANK OPERATED TYPES

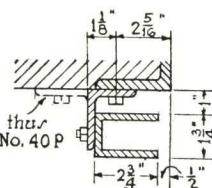
Type CG-11 and Type KG-11				Type CG-22			
Opening height	A, in.	B, in.		Opening height	A, in.	B, in.	
Big 4 Slat				Big 4 Slat			
7'1" to 9'11"	16	16½		8'7" to 11'6"	16	16½	
10'0" to 11' 4"	17	17½		11'7" to 13'0"	17	17½	
11'5" to 14' 2"	19	19½		13'1" to 16'0"	19	19½	
14'3" to 15' 1"	20	20½		16'1" to 17'0"	20	20½	
15'2" to 17' 0"	21	21½		17'1" to 19'0"	21	21½	
17'0" to 18' 5"	22	22½		19'1" to 20'6"	22	22½	
18'6" to 20'10"	23	23½		20'7" to 23'0"	23	23½	



Section Through Head
of Opening

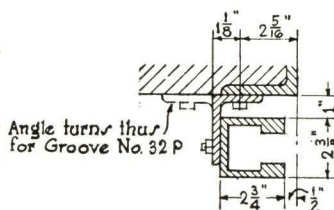


GROOVE NO. 40 A



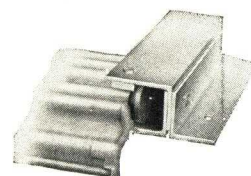
GROOVE NO. 40 N

These Grooves to be used when Opening Width is less than 14'-0" and Opening Height is less than 16'-0"



GROOVE NO. 32 N

This Groove to be used when Opening Width is over 14'-0" and Opening Height is over 16'-0"



Safety Groove and Wind
Lock

WILSON UNDERWRITERS' LABELED STEEL DOORS

Types of Doors

Underwriters' Labeled doors are classified by types in accordance with use, as follows:

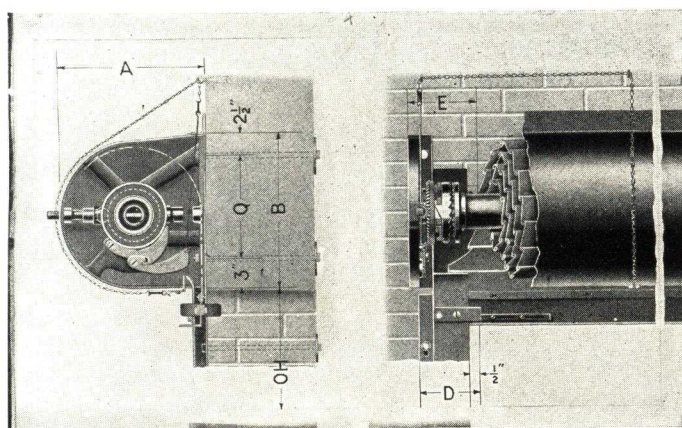
Class "A"—Fire Wall Doors—Area of wall opening not to exceed 80 sq. ft.; neither width nor height to exceed 12 ft. *Two doors* are recommended, and may be hung on face of wall or between jambs, self-coiling or crank operation, and close automatically in case of fire. Wilson Type Nos. 31 to 35, inclusive, interlocking slat No. 2.

Class "B"—Vertical Shaft Doors—Area of opening not to exceed 80 sq. ft.; neither width nor height of opening to exceed 12 ft. Curtains may be hung on

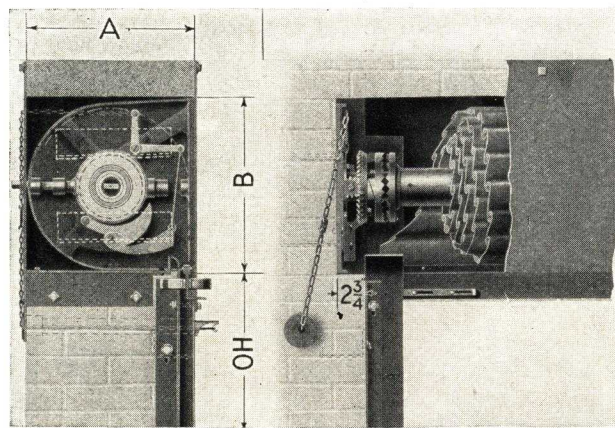
face of wall or between jambs, self-coiling or crank operation, and where required are automatic closing in case of fire. Wilson Type Nos. 21 to 26, inclusive, interlocking slat No. 2.

Class "C"—Corridor and Room Partition Doors—Same requirements as Class "B."

Class "D"—Exterior Wall Doors—Area of wall opening not to exceed 100 sq. ft.; neither width nor height to exceed 12 ft. Curtain may be hung on face of wall or between jambs, self-coiling, chain or crank operation, and, where permitted, may be automatic closing in case of fire. Wilson Type Nos. 41 to 51, inclusive, interlocking slat Little 4.



Door Applied to Face of Wall

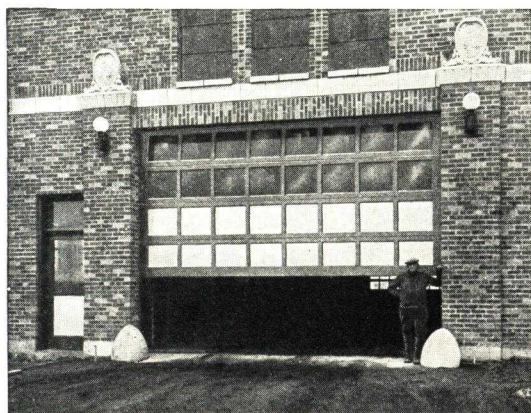


Door Applied Between Jambs

CLEARANCE SCHEDULE FOR UNDERWRITERS' LABELED ROLLING STEEL DOORS

Opening height		Class A, B and C Doors For requirements, see text above					Opening height		Class D Doors For requirements, see text above						
		No. 2 slat and fire stops							Little 4 slat and fire stops						
		Ft.-in.	Ft.-in.	A, in.	B, in.	Q, in.			E	D	Ft.-in.	Ft.-in.	A, in.	B, in.	Q, in.	E	D
4-10		14	14½	9	Opening width under 8'-0" equals 6"	Opening width under 8'-0" equals 5¼"	4-10		14	14½	9	Opening width under 10'-0" equals 6"	Opening width under 10'-0" equals 5¼"		
4-11 to 6-5		15	15½	10			4-11 to 6-5		15	15½	10				
6-6 to 8-0		16	16½	11	Opening width over 8'-0" equals 7"	Opening width over 8'-0" equals 6¼"	6-6 to 8-0		16	16½	11	Opening width over 10'-0" equals 7"	Opening width over 10'-0" equals 6¼"		
8-1 to 9-9		18	18½	13			8-1 to 8-7		17	17½	12				
9-10 to 12-0		19	19½	14			8-8 to 10-8		18	18½	13				
							10-9 to 12-0		19	19½	14				

WILSON SECTIONFOLD DOORS OPERATING OVERHEAD



For public and private garages, bus terminals, warehouses, freight stations, filling stations, etc.

Hand, chain or motor operated. Glass panels or wicket doors furnished where required. Paneled to match or harmonize with surrounding conditions. Metal covered when necessary.

Stock Doors

For convenience and economy we carry a supply of stock doors for the following opening sizes: 8 ft. in width; the height varying in 6-in. intervals from 7 ft. 0 in. Stock doors also available 10 ft. x 8 ft.; 10 ft. x 10 ft.; and 10 ft. x 12 ft.

Special Doors

For opening in front of hydraulic lifts we have developed a spiral drum construction which allows the door to lift vertically to any desired height before going into the horizontal plane. Thus, an 8-ft. high door may be raised to lay next to a 13-ft. ceiling without any excessive lifting power required.

See SWEET'S ARCHITECTURAL CATALOGUE for details, operations, etc.

THE KINNEAR MANUFACTURING CO.

Exclusively Door Manufacturers

820-870 Field Avenue
COLUMBUS, OHIO

BRANCH OFFICES

BOSTON, MASS., 294 Washington Street
NEW YORK, N. Y., 342 Madison Avenue
PHILADELPHIA, PA., 504 Wesley Building
WASHINGTON, D. C., 1514 17th Street, N. W.
PITTSBURGH, PA., 6906 Thomas Boulevard
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BALTIMORE, MD., 1305 Fidelity Building

AGENTS IN PRINCIPAL CITIES

CLEVELAND, OHIO, 611 Union Building
CINCINNATI, OHIO, 528 Walnut Street
DETROIT, MICH., 7710 Woodward Avenue
CHICAGO, ILL., 128 North Wells Street
KANSAS CITY, MO., 4259 Jefferson
SAN FRANCISCO, CAL., 361 Brannan Street

Products

STEEL, BRONZE or ALUMINUM ROLLING DOORS and SHUTTERS for service purposes.

STEEL ROLLING FIRE DOORS and SHUTTERS.

WOOD ROLLING INTERIOR PARTITIONS.

STEEL or WOOD BIFOLDING DOORS.

WOOD ROLLING DOORS for roundhouses.

POWER UNITS (Motor Driven Door Operators).

"ROL-TOP" DOORS.

Also Vertical Sliding Doors.



TRADE-MARK

For more complete details and specifications than given herein, write any of the above branch offices for the comprehensive Kinnear Door Plan and Data Catalogue.

Types

Kinnear steel rolling doors and shutters are manufactured and sold under two distinct classifications, viz., Service and Labeled Types. Service doors are designed entirely for such openings as do not require Underwriters' label and where insurance rates are not a consideration.

STEEL ROLLING DOORS

Construction of Steel Rolling Doors

Kinnear steel rolling doors are constructed of the highest class of materials by expert door builders, mechanics especially trained in the exclusive manufacture of doors.

The curtain proper on all Kinnear doors is made of open hearth interlocking steel slats, galvanized and equipped with malleable iron endlocks. This curtain is coiled upon a barrel journaled in heavy cast iron brackets and it travels in steel guides mounted at sides of openings.

Installation of Rolling Doors

Doors in general are mounted on face of wall with brackets and coil entirely above the bottom of lintel and with edges of guides flush with face of opening jambs.

Where headroom is limited and door can not be installed on face of wall, it can be mounted in the

opening, in which case the brackets and coil would be placed directly under the lintel and guides would be located on the jambs or in reveals provided in the jambs.

The curtain is counterbalanced by means of helical springs which are enclosed in the barrel.

A galvanized steel hood of suitable design is supplied with each door.

At Left:

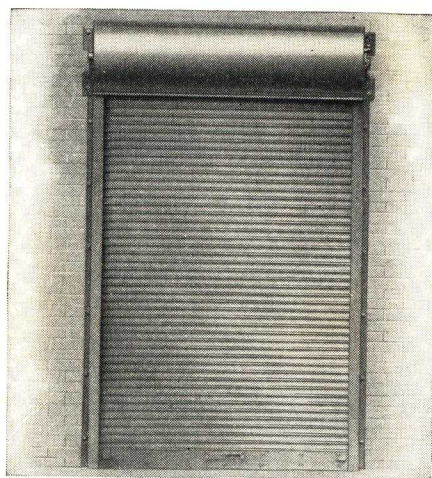
Face of Wall Mounting of Vertical Track and Curtain Coil

Clear opening maintained. Door installed on any type wall with expansion or machine bolts. Same arrangement applicable for doors mechanically or motor operated

At Right:

Vertical Section of Between Jamb Mounting

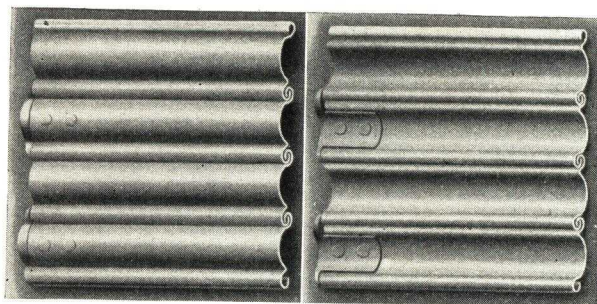
When used, where opening can be properly prepared, coil and spring barrel is placed in wall. May be arranged for mechanical or motor operation



At Left:

Elevation of Type FM 10, Mounted on Face of Wall

Push-up construction, spring counterbalanced. Operative from either side and provided with slide bolt locking device. Chain or crank operation is recommended for doors exceeding 80 sq. ft. Similar types for installation between jambs where opening can be prepared



Slat No. 2 Used on Average Size Doors, 1 3/4 In. Wide on Centers, 1/2 In. Deep Crown

Made in Nos. 22, 20, 18 and 16 U. S. Gauges. Large slat No. 4 used on large doors, 2 1/4 in. wide, 7/8 in. crown. Concave view shows alternating endlocks. Endlocks prevent lateral movement and wear on end of slat

Operation of Rolling Doors

The methods of operation most commonly used are:
Push-up—Manually opened and closed by means of handles in bottom plate. (Not recommended for doors exceeding 80 sq. ft. in area.)

Chain—Mechanically operated by hand chain, sprocket and reduction gear.

Crank—Mechanically operated by hand crank, shafting and reduction gear.

Power—Driven by electric motor, controlled by one or more push button stations conveniently located.

Between Jamb

Manual Operation, with Vertical Guides and Coil Placed in Wall

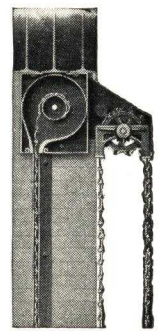
Handle placed in bottom bar of curtain. Helical torsion spring gives perfect counterbalance of curtain, making manual operation suitable for doors up to 80 sq. ft.

Mechanical Operation by Endless Chain and Reduction Gearing

Chain operation can be placed on side of wall desired. Recommended for doors exceeding 80 sq. ft.



Manual operation



Mechanical operation

Face of Wall Mountings

(See illustrations in column opposite)

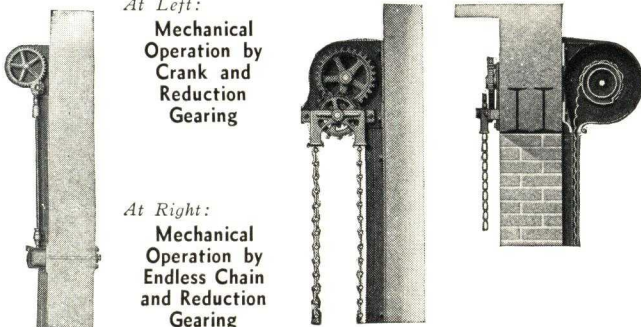
Mechanical Operation by Crank and Reduction Gearing—Operative from either or both sides of wall. Crank to be removed to prevent use of door. Recommended for large doors where chain or motor operation is not desired.

Mechanical Operation by Endless Chain and Reduction Gearing—Arranged for operation on side of wall on which door is installed. Gearing compact and placed on either end of barrel to suit operating convenience.

Operating by Means of Endless Chain and Reduction Gearing Placed on Side of Wall Opposite Installation of Door—Gearing placed flat to wall. Door made inoperative by locking chain to wall clip.

At Left:

Mechanical Operation by Crank and Reduction Gearing

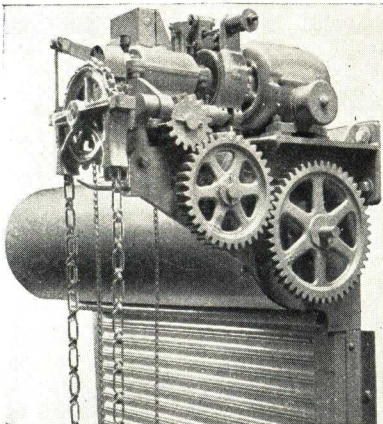


At Right:

Mechanical Operation by Endless Chain and Reduction Gearing

At Right:

Two Views of Operation by Means of Endless Chain and Reduction Gearing Placed on Side of Wall Opposite Installation of Door



Power Unit

Power Units

Steel Rolling Doors are especially adaptable to electric motor operation and Kinnear power units are made to fit any size door. Its perfection of design is the result of years of experimentation and operating tests. Where it cannot be applied as illustrated, special application can be provided.

Operation Through Reduction Gearing—Momentary contact of operating switch button completes circuit for starting motor. At completion of door travel, limit switch breaks electric circuit and stops motor with a positive acting mechanical brake. Emergency operation is accomplished by engaging a sprocket and chain, which automatically adjusts reduction gear and motor brake, and disconnects motor circuit. Operating stations may be conveniently located.

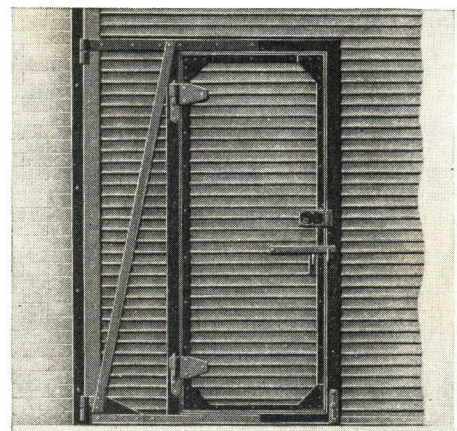
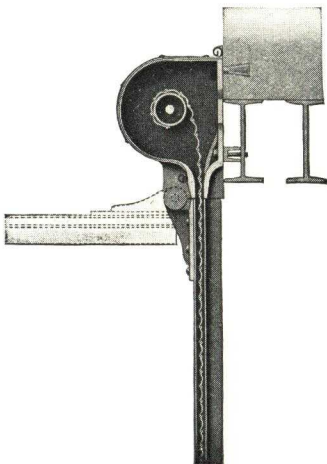
With unit, are supplied a safety type fusible line switch, automatic limit switch, a three button switch and magnetic reversing panel. Motor used is a high starting torque elevator type motor. Wires, conduit and fuses must be supplied by others and all connections, wiring and erection of switches to be done by others in accordance with wiring diagrams furnished. Details, specifications and other information will be supplied upon request. Current characteristics should accompany all requests.

Swinging Post

Wide openings can often be more economically closed with a number of small doors, than by a single large door. This can be accomplished by the use of an intermediate post that may swing up out of the way. This permits use of all or part of the opening as desired. (See illustration at left).

Access Door

Large doors, when necessary, can be provided with a wicket or pass door, which may be operated independently of large door. It is carried on a steel frame that swings to the side of the opening when the main door is operated. (See illustration at right.)



FIRE DOORS AND SHUTTERS

Constructed Under the Supervision of the Underwriters' Laboratories, Inc., and Labeled

Important Features

Kinnear fire doors and shutters are specially designed for fire protection. Details of construction have been carefully developed. The following are some of the important features:

(1) An auxiliary or inner hood is automatically dropped and closes space between barrel and outer hood, thereby preventing passage of flame over barrel.

(2) Special endlocks closing concaved ends of slats, preventing passage of flame around edge of curtain.

(3) Fusible washers employed in the construction of grooves which melt and allow the members

composing the grooves to expand without buckling.

(4) Non-corrodible metal used for bearings and contact points of the automatic release.

(5) Single line contact bearings in releasing levers.

(6) Provision made for expansion of parts for all temperatures up to 1800° F.

(7) Disposition of fusible links, insuring prompt closing.

(8) Enclosure of automatic release, protecting from weather.

(9) Safety device controlling the speed of curtain in automatic closure.

Akbar Fire Doors

A distinct Kinnear product, embodying special construction features that provide sufficient counterbalance for easy service operation, sure acting automatic fire closing equipment and effective fire retardant qualities increasing fire door utility and protective value.

Push-down Spring—Unlike other fire doors positive closure of Akbar doors is insured by the use of an auxiliary motor or push-down spring. Under normal operation this spring remains on tension, the counterbalance spring provides sufficient torque for operation, giving proper counterbalance to the door. When the automatic equipment is released by fusing of tension link from heat of fire, the auxiliary spring is released, giving a powerful starting and push-down force to the door. Action of counterbalance spring is not altered. For resetting the automatic equipment, the release levers are reset and the door is manually raised, winding the push-down spring to its original position.

Safety Governor—An oscillating governor placed at end of barrel becomes operative when automatic equipment is released. It regulates speed of downward travel of curtain, preventing injury to any person who may be in doorway; also prevents curtain from hitting sill with sufficient force to cause rebound and jamming of slats in guides. Other points of Akbar construction

are in keeping with these distinctive features, in addition to embodying the customary fire door requirements.

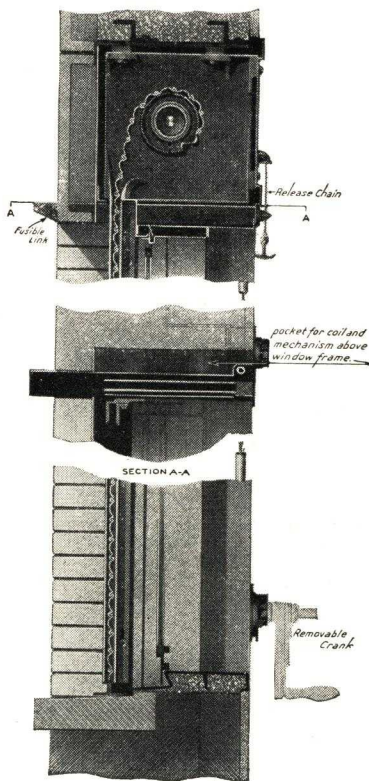
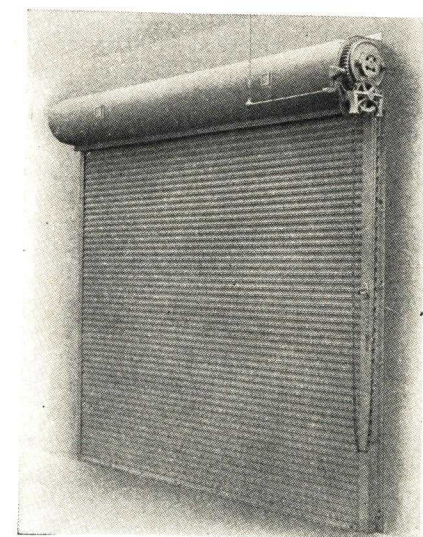
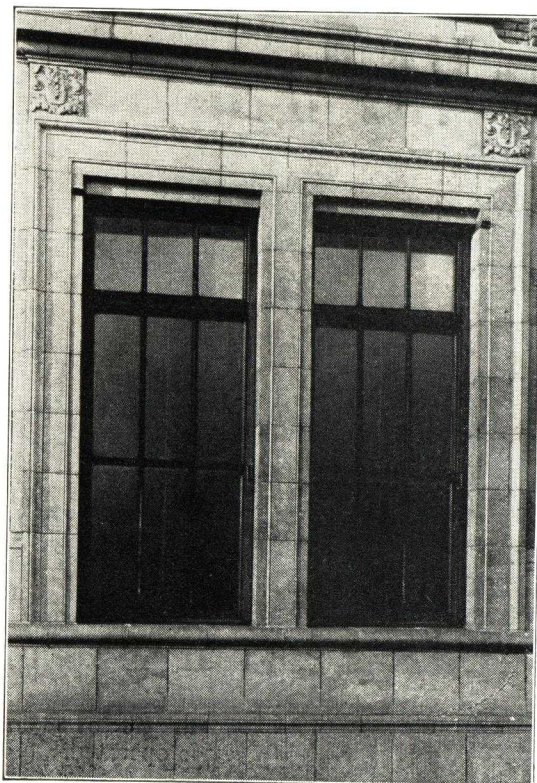
"Superior" Fire Shutters

Labeled for exterior window openings not exceeding 100 sq. ft. area, width or height not to exceed 12 ft.

Shutter normally remains open. Closes automatically immediately upon parting of fusible link, being driven from open to closed position by means of a powerful push-down spring.

Design permits of periodic testing to assure unfailing automatic closing. After testing, accomplished by tripping release chain, shutter can be quickly raised to open position by gearless rewind mechanism and hand crank accessible from floor.

Equipped with impact starting device striking a hammer blow of 200 inch pounds simultaneously with fusing of link or tripping of release chain; this insures complete closure.



BIFOLDING DOORS, WOOD OR STEEL

In cases where light is desired through doors, the bifolding type lends itself readily to such condition. These doors may be constructed either of wood or steel, and are of two sections hinged at the center and pivoted at top of opening. The upper panel may be fitted with sash, giving a glass area of about two-thirds the total area of the panel.

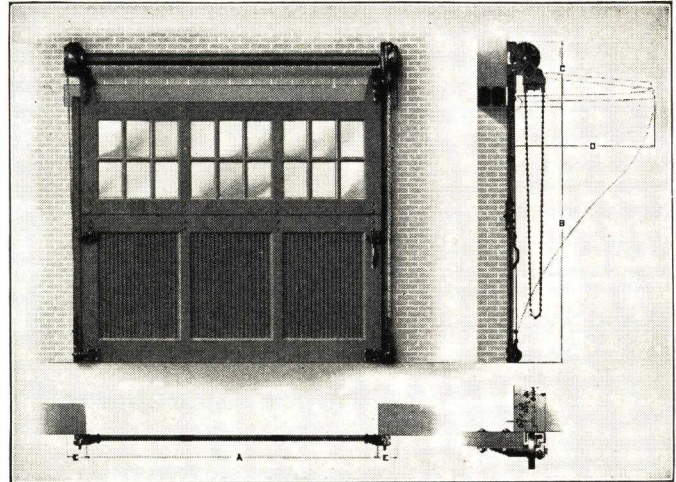
Bifold No. 5

This is without doubt one of the most practical bifolding doors now on the market, requiring less clearance at both head and sides of opening than do most other types.

Kinnear Bifold No. 5 is designed with a spring counterbalance, eliminating the heavy counterweights usually used on this type of door. Steel cables connect the door to the counterbalancing device at the top of the opening. Bottom panel is fitted with rollers which travel in guides attached to wall and transmit the thrust.

The simplicity and sturdiness of the mechanism reduces maintenance to a negligible factor and renders quick and easy operation. Less side clearance is required as there are no counterweights. Send us a sketch showing conditions as they actually exist and we will show how this flexible construction adapts itself to other than standard conditions.

Kinnear panels are fabricated in our own factory from extra heavy materials and are built on a purely quality basis. Write for prices and catalogue.



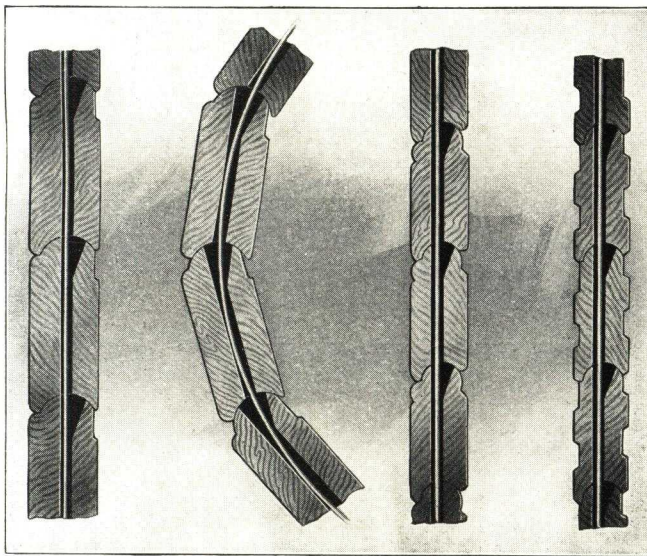
Bifold No. 5

CLEARANCES REQUIRED FOR BIFOLD NO. 5

Height B	6' 0"	7' 0"	8' 0"	9' 0"	10' 0"	11' 0"	12' 0"	13' 0"	14' 0"	15' 0"
C	26½"	26½"	26½"	26½"	28½"	31"	33"	35"	35"	37"
D	3' 10"	4' 4"	4' 10"	5' 4"	5' 11"	6' 6"	7' 1"	7' 8"	8' 2"	8' 9"
E	8"	8"	8"	8"	8"	10"	10"	10"	10"	10"

Dimension A should not exceed 18 ft.; dimension B should not exceed 15 ft.

WOOD ROLLING DOORS AND PARTITIONS



No. 27

No. 27

No. 26

No. 24

Sections of Wood Slats

Wood Rolling Doors for Roundhouses

Where chemical action deteriorates steel, as in the case of round houses and chemical plants, wood rolling doors are particularly desirable. These doors are constructed of wood slats assembled on phosphor bronze tapes. Slats are made of cypress and treated with a coat of wood preservative. Slat No. 27 is used for exterior doors. Counterbalance is accomplished by a

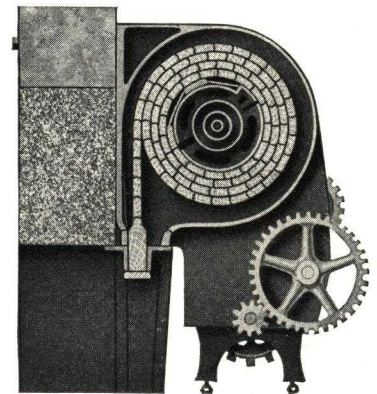
helical spring similar to type used on steel doors. Curtain coils on barrel placed either on face of wall or in casement.

Wood Rolling Partitions for Schools and Churches

Wood rolling partitions are assembled similar to the wood rolling doors for exterior use, but composed of slats No. 26 or No. 24, made of long leaf yellow pine, cypress, quarter sawed oak or birch. Where other woods are desired, our Engineering Department should be consulted as to suitability of such woods. Coil is concealed under lintel. For large doors, mechanical operating devices can be concealed in casing. Casing and grooves are not supplied by Kinnear.

Endless Chain and Reduction Gearing Unit for Mechanical Operation of Large Size Doors

Works similar to unit on Steel Rolling Doors. Where used on interior partitions, it is arranged for concealing in casing



F.H.W. 22. Construction

KINNEAR "ROL-TOP" DOORS

(Overhead Operating Type)

Uses

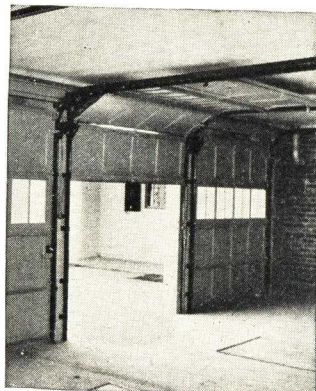
The "Rol-Top" Door, because of its efficiency, sturdiness and provision for light is becoming increasingly popular for industrial and commercial buildings, warehouses, public garages and service stations, as well as residence garages and numerous special applications for which they are suited.

Advantages

Like other Kinnear products, the "Rol-Top" Door is designed to give maximum convenience and serviceability. Rolling up and out of the way "Rol-Top" gives complete opening clearance . . . requires no costly floor or wall space . . . car or other objects can be placed within fraction of an inch of either side of door . . . and snow, sleet or ice cannot impede operation. Thoroughly tested stretch or torsion springs insure perfect counterbalance.

Alternate Construction

Rol-Top Doors are built in either the standard construction, or with Kinnear special construction features for those who want the best in door service and efficiency. Counterbalance can be of single spring, neatly placed between door tracks, insuring perfect synchronized balance. Kinnear special steel truss members give door rigidity, and guards against warpage or sagging of door. Other features are offered. When needing doors write or call Kinnear for alternate recommendations, as "Rol-Top's" improved features are worthy of careful consideration.



"Rol-Top" Doors

Door rolls up out of way . . . saves floor and wall space . . . snow or ice cannot impede operation. Spring counterbalance is neat and permits door being raised any height. Weathertight and burglarproof when closed

Special Rol-Top Features

Tested precision spring counterbalance insuring easy operation.
Requires no floor or wall space.
Will not sag, bind or warp—special Kinnear truss members.
Wind, ice or snow will not impede operation.
Seal-tight device insures weathertightness—fits jamb snugly.
Light, yet strong, dependable and offers flexibility of use.
Neat, attractive and harmonizes with any architecture.
All hardware, tracks and locks of heavy and sturdy design.
Built and backed by a company with thirty-six years' specialized door experience.

Sizes and Auxiliary Equipment

Sizes in stock for immediate shipment 8x8 ft., 8x7 ft., 6 in. and 8x7 ft. Other sizes quickly fabricated to order; and in any size engineeringly practical. Any number of sash sections. May be equipped with endless chain and reduction gearing, motor unit or automatic opening device.

Other auxiliary equipment such as wicket or pass door; sliding or swinging center mullion for using more than one door to opening; and hi-lift construction for doors in front of hydraulic lifts can be furnished for the "Rol-Top."

Installation

"Rol-Top" comes in sections with hardware applied and other materials for erecting (by following instructions furnished) with speed, ease and economy.

Glass and opening preparation provided by purchaser.

When considering use of "Rol-Top" write for data on clearances and opening preparation.

Motor Operation

The "Rol-Top" motor operator has been designed especially for the "Rol-Top" Door and offers a reliable, well constructed operator embodying unique features that are the results of Kinnear's years of experience in building door operators. It offers a means for dependable remote door control by push button, pull cord, key switch or other switch devices.

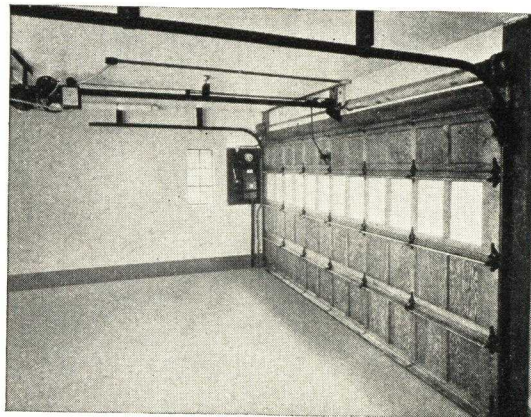
Details will be gladly sent on request.



At the left:

Two Typical Installations of "Rol-Top" Doors

These are similar to ones used in all types of buildings . . . a sturdy, efficient service door which permits use of light sections

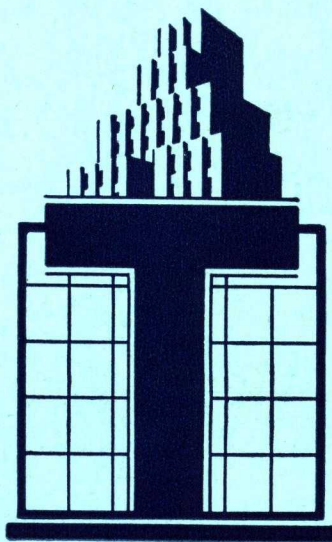


A Motor Operated "Rol-Top"

Showing neatness of motor installation and a Deluxe Model "Rol-Top," having a single spring counterbalance and Kinnear truss members . . . two valuable door features. Any number of operating stations can be used with operator

TRUSCON

MANUFACTURERS OF A COMPLETE
LINE OF STEEL BUILDING MATERIALS



ENGINEERING PRODUCTS

TRUSCON STEEL COMPANY, YOUNGSTOWN, OHIO

THE COMPANY AND ITS PRODUCTS

THE TRUSCON STEEL COMPANY is an institution of national scope—the largest company of its kind in the world, manufacturing a complete line of steel building products.

They have been developed in accord with modern requirements for utility and quality, and include individual units peculiarly suited to all types of building and every structural condition.

STEEL WINDOW PRODUCTS
Double-Hung—
Donovan Awning Type—
Counter-Balanced—
Pivoted—
Continuous—
And Projected Windows
Mechanical Operators
Steel Casements
Silentaire Windows
Basement Windows
Steel Frames
Steel Lintels
Silentaire Noise Excluder
Erection

STEEL DOORS
Swing and Slide
Accordion
Vertical Lift

Vertical Lift-Swing
Bifolding
Overdoors
Canopy Type
Airplane Hangar

COMPLETE BUILDINGS
Flat Roof Types
Pitched Roof Types
Wintergardens
Auto-Servitoriums
Ferrocld Walls
Structural Steel
Erection

STEELDECK ROOFS
Ferrobord Type
Stucco-Steel
Ferroplate Type
Ferrocoustic Type

FLOOR SYSTEMS
Teegrid Bridge Floors
Channelplate
Plategrid Open Flooring
Floorgrid

FERROCLAD PANELS
Metalclad Insulation
Armormply

METAL LATH PRODUCTS
A-Metal Laths and Hy-Rib
Doublemesh Herringbone
Insulmesh
Plasterboard
Stucco-Steel
Metal Plasterboard
Corner Beads

Due to unusually efficient manufacturing facilities, dependable workmanship is assured. This is supplemented by a nation-wide engineering organization.

The TRUSCON STEEL COMPANY of 1933 represents "Thirty Years of Pioneering and Leadership" and the following noteworthy line of nationally known products:

Cornerite
Channels and Studs
Mortar Boxes
Metal Trim

STEEL JOISTS
O.T. (Open Truss) Joists
Nailer Joists
P-G (Plate Girder) Joists
Clerspan Trusses
Accessories

REINFORCING STEEL
Rib Bars
Kahn Trussed Bars
Column Hooping
Steel Forms
Floretyles
Locktyle
Inserts

ROAD REINFORCING
Welded Steel Fabric
Contraction Plates
Expansion Joints
Curb Bars
Edge Protectors
Steel Road Forms
Highway Guards
Railroad Crossings

STEEL POLES
Distribution Poles
Telephone Poles
H-Frames
Pipe Line Supports
Electrification Structures
Floodlighting

BOXES AND PLATE FORMS
Beer Cases

Boxes for Beverages
Material Handling

FOUNDRY FLASKS

PRESSED STEEL
Automobile Frames
Truck Frames
Brake Drums
Axle Housings
Refrigerator Cabinets
Washing Machine Tubs
Tunnel Liner Plates

LABORATORY PRODUCTS
Waterproofings
Technical Paints
Floor Hardeners
Cement Roofing Tile

SUPPLEMENTARY ENGINEERING SERVICE

TRUSCON does more than manufacture building products—it offers a further service through the development of products to meet ever-changing needs and coordinates the uses of these to achieve the greatest possible efficiencies.

To render this service requires highly trained perception, judgment and skill. The breadth of vision of a commercial engineer depends, to a great extent, upon the variety of products manufactured by the parent company. An engineer employed by a company making nothing but steel joists will see in every project coming to his attention only the chance to use steel joists, while a structural steel engineer will be using structural steel at every possible point, whether

these types of constructions are appropriate or not. The same can be said for the engineers of bar companies which are handling no other building materials.

Conversely, engineers employed by a company like Truscon, which is developing and marketing all types of steel building materials, have a broadness of experience which enables them to recommend the kind of material or arrangement of structural units that best fits the specific requirements.

This service, which is rendered by Truscon engineers, is not intended in any way to replace the service of the architectural engineer. It is supplemental, and is free for the asking.

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A COMPLETE LINE OF STEEL WINDOWS

TRUSCON Windows cover a wide range of building requirements and at the same time meet every condition of beauty, architectural harmony, simplicity, fine quality and superior craftsmanship demanded by the industry.

TYPES OF WINDOWS

Double-Hung Windows—(steel, aluminum or bronze). In types and sizes to meet architectural requirements.

Awning Type Windows—Prevent sun glare and drafts; ideal for schools and hospitals.

Casements—A complete line for monumental and public buildings, institutions, apartments and dwellings, including screens and operators for screens and artistic hardware.

Silentaire Windows, Casement Type—With integral non-mechanical noise mufflers.

Monumental Projected Windows—For quality installations in good buildings.

Detention Windows—For prisons, reformatories and psychopathic hospitals.

Architectural and Commercial Projected Windows—A practical window for a wide range of applications.

Continuous Windows and Operators.

Pivoted and Utility Windows.

STEEL DOORS DESIGNED TO MEET EVERY POSSIBLE NEED OF INDUSTRY

TRUSCON engineers were among the first to recognize that for maximum efficiency doors should be designed for the specific kind of work they should be called upon to perform. As a consequence, Truscon has developed a series of practical doors, each type of which is particularly efficient for certain installations, but all having in common the ability to withstand hard usage, to afford fire protection and to function indefinitely.

TYPES OF DOORS

Industrial Doors—For large and small openings.

Overdoors—Operating overhead.

Accordion Doors—Leaves fold against each other like a jack-knife.

Vertical Lift Doors.

Canopy Doors and Bifold Doors.

Airplane Hangar Doors—In various styles, straight track types, curved track types, canopy, telescoping and projected types.

Pier Doors—A vertical lift-swing type.

INDUSTRIAL CANOPY DOORS

THIS type is an all purpose door. It fits in anywhere, from the small individual residence garage to largest openings required in locomotive roundhouses.

The Industrial Canopy Door is opened or closed by one of the simplest sets of operating hardware built for any door of its type. The hardware has been carefully designed and perfected through years of continuous manufacture and service. Very few moving parts are necessary and on these, ball bearings have been installed to reduce friction.

Series 800LT—Doors up to and including 100 sq. ft. in area. Stiles and rails are 1½x5 in. Industrial Rail Tube. The upper section of the leaf is fitted with steel windows of standard design. The lower portion is fitted with steel panels made from patent leveled sheets of 14 gauge on doors 10 ft. high or over and of 16 gauge on doors under 10 ft. high. Operation is by hand.

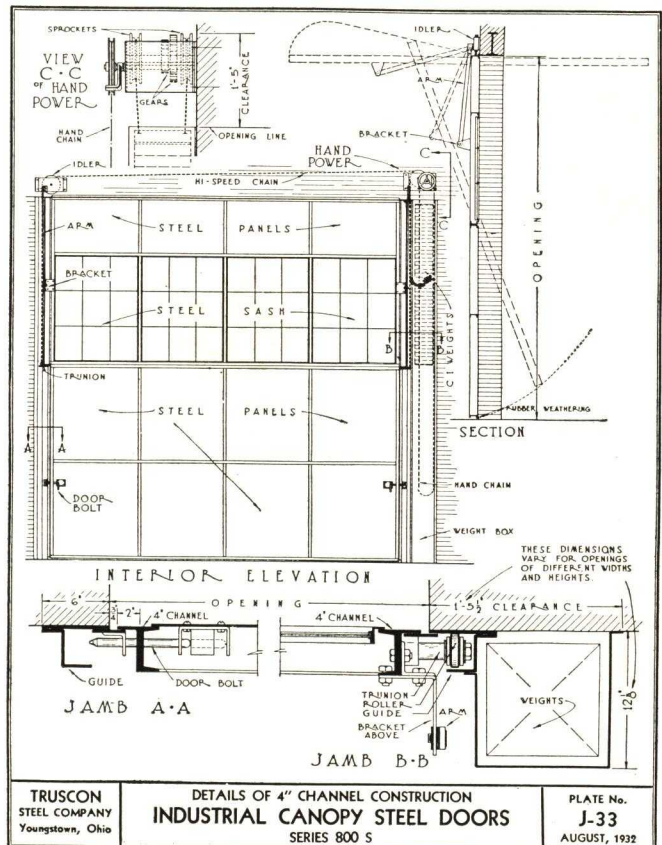
Series 800S—Doors over 100 sq. ft. in area. Stiles and rails are either 3-in. or 4-in. structural channels. Upper portion of the leaf is fitted with steel windows of standard design. Lower portion is fitted with steel panels made from patent leveled sheets of 13 gauge. Operation is by mechanical power operated by hand chain. If desired an electrical operation will be furnished.

Doors of both types are perfectly balanced at any degree of opening by cast-iron counterweights. The vertical travel is controlled by structural steel guides furnished by the door manufacturer. Rollers fastened to trunnions at both jambs operate in these guides and are so placed that the upper portion will balance the lower portion when the door is open, forming a canopy over the opening. The swinging action of the leaf is controlled by heavy swing arms fastened near the top of the door.

The weathering on either the Series 800LT or Series 800S is perfect. On both types it is steel at the head and both jambs, while at the bottom canvas insert rubber weathering is furnished.

Installation is simple and does not require expensive steel frames or structural steel supports.

SERIES 800LT AND 800S



VERTICAL LIFT-SWING DOORS

SERIES 1000T—Tubular SERIES 1000S—Structural Steel

DESIGNED primarily for piers these doors can be used in any type of structure by changing the arrangement of the operators slightly. Because of their rugged construction these doors are particularly adaptable to extremely large door openings.

When opened, the doors are out of the way; when closed, they form positive protection against intruders and from the elements. They are easy to operate and render continued, unflinching service. With these features Truscon engineers have incorporated permanence and durability. Many hundreds of these doors have been built and are being used today in the most modern and up-to-date piers.

The door is divided horizontally into two equal sections. The upper section contains the glass and provides excellent daylighting for the interior. The lower solid section slides vertically in guides on the door jamb into guides on the upper section which is hinged to the lintel. The nested sections can then be swung inward to any angle up to a horizontal position. The raising and swinging movements are accomplished by operators with hand or electric power control. All mechanical details have been designed with great care.

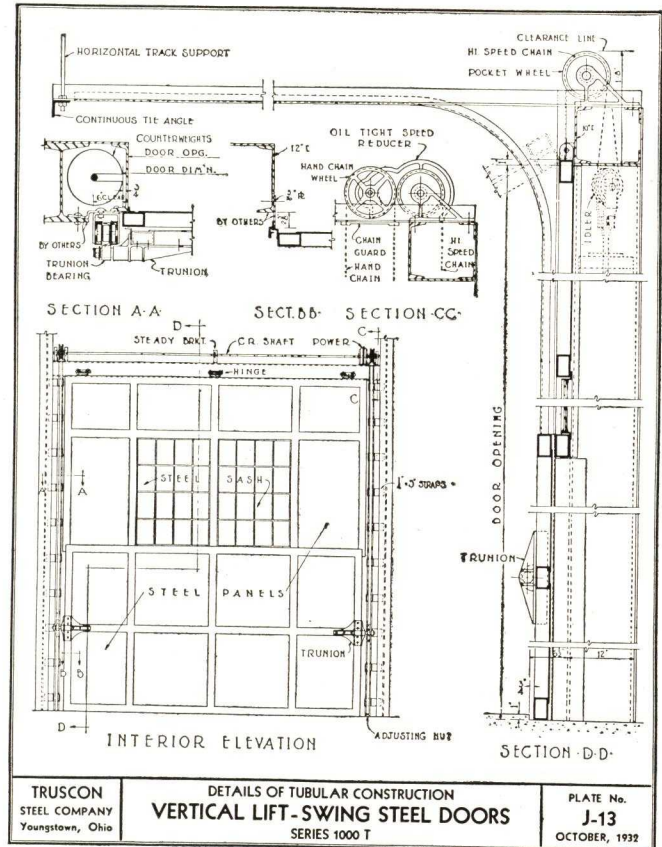
The lower portion of the doors is fitted with 13 gauge steel panels fastened in place with machine screws. The upper portion is fitted with windows built up of Truscon standard members, not less than $1\frac{7}{8}$ in. deep, with all joints air-hammer riveted and with the glass held in place with steel window putty and spring wire glazing clips or continuous steel glazing angles.

Corners and intersections are welded and ground smooth. All welds develop the full strength of the section. Corners are mitered.

Pilot doors, opening inward, are provided in the lower leaf where indicated. They are equipped either with a two cylinder spring latch and dead-bolt mortise cylinder lock, or a lever latch with padlock brackets. All hardware is flush on the outside.

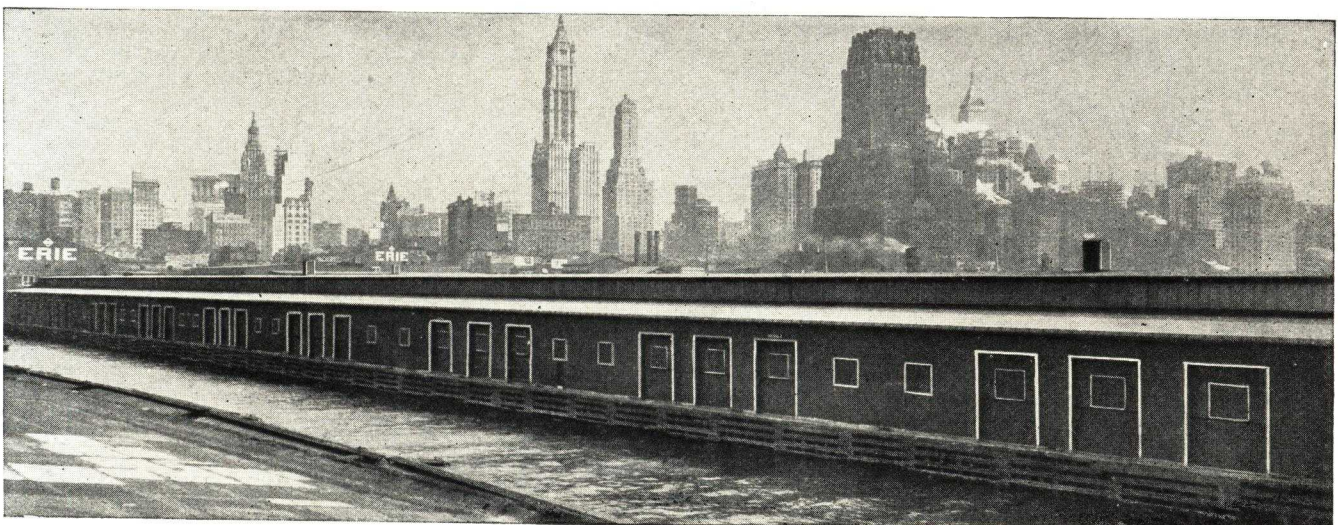
The lower leaf is equipped with Truscon extra heavy specially designed hardware. The upper leaf is equipped with specially designed Truscon extra heavy steel hinges and guides.

Series 1000T, Tubular Construction—These doors are constructed from cold-rolled welded steel tubing, with additional horizontal and vertical reinforcing members where required for



strength and rigidity. The stiles, top rail, cross rails and bottom rail are of $4 \times 2\frac{1}{2}$ -in. 13 gauge tubing.

Series 1000S, Structural Steel Construction—These doors are constructed from structural shapes with additional horizontal and vertical reinforcing members of the same material where required for strength and rigidity. The stiles, top rail, cross rails and bottom rail are hot-rolled channels of suitable size.



Erie R. R. Pier No. 21, North River, New York, N. Y.

GRAHAM KING, Architect

TRUSCON STEEL COMPANY—YOUNGSTOWN—OHIO—U.S.A.

INDUSTRIAL DOORS FOR LARGE OPENINGS

INDUSTRIAL Doors for large openings meet every requirement of practical use and protection and are designed to fit the conditions of industry. They have been perfected through extensive use in industrial buildings of all kinds and are furnished in practically any size and arrangement, and with any method of operation.

All stiles and rails are constructed of 13 gauge cold rolled welded steel tubing, 4x2½ in. Corners and intersections are welded and ground smooth. The upper portion of the doors is fitted with a window built up of Truscon standard members. The lower portion is fitted with panels made of patent leveled sheet, not less than 13 gauge, fastened in place by machine screws.

Sliding doors are hung from Truscon standard double-wheel trolleys and heavy channel track and are equipped with back stops, binders and complete hardware.

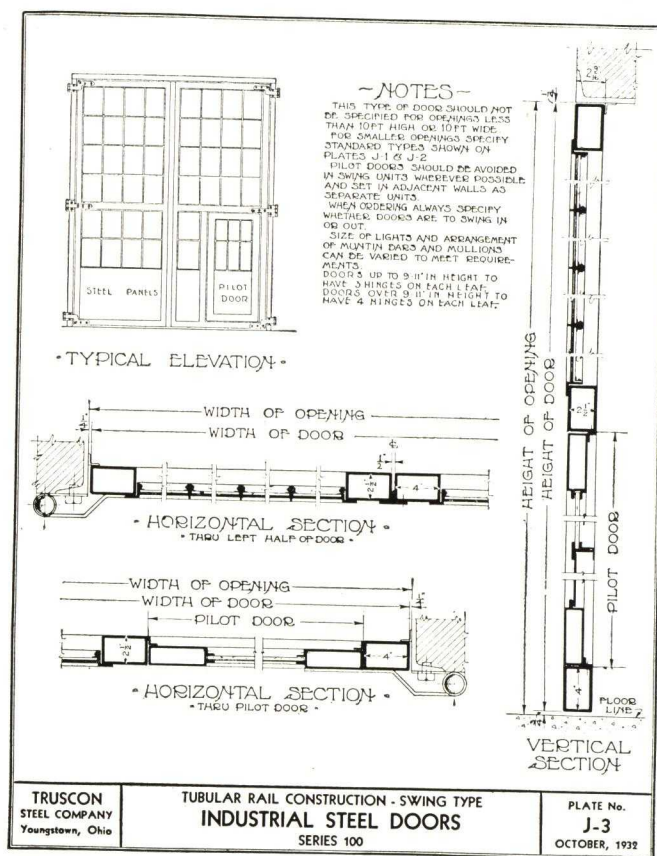
Swinging doors are equipped with Truscon Standard heavy steel strap hinges. (Ball bearing butt hinges furnished if specified.) All swing doors are equipped with Truscon Standard mortise cylinder Cocks (or lever latch and padlock brackets) and heavy handles inside and out (cylinder lock not furnished on doors over 50 sq. ft. in area).

Pilot doors may be provided adjacent to jamb if specified. They are of standard Truscon industrial tube type equipped with cylinder lock.

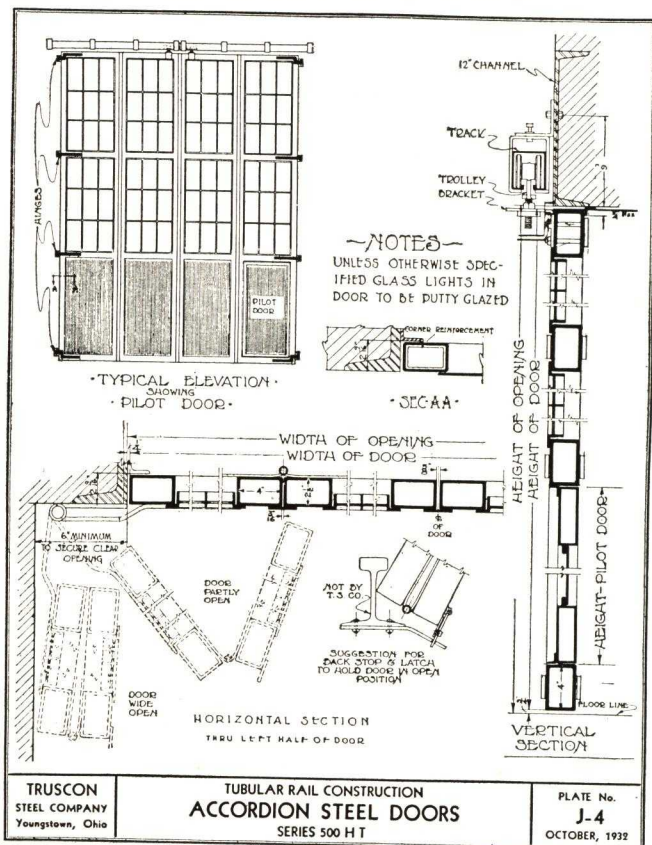
Doors are shipped with complete hardware, such as track, brackets, trolleys, hinges, cam bolts and binders. Astragals are provided with all double swing or double slide doors as weathering between leaves.

Furnished for openings more than 10 ft. high or 10 ft. wide. Suggestions on types of Industrial Doors to meet special conditions will be furnished without obligation.

SERIES 100 Seamless Tubular Rail, Swing and Slide Types



ACCORDION DOORS



SERIES 500HT AND 500LT

THESE doors are used extensively in railroad structures and other buildings requiring maximum height of door opening with minimum obstruction. They are particularly adaptable in extremely wide or high openings where a swing door would ordinarily be used.

In operation, the leaves fold against one another and since they cannot bind or jam, one person can open or close them easily. They are hung at the top from heavy four-wheel roller and ball-bearing trolleys, running in a heavy channel track placed above the opening. They are shipped with complete hardware, such as track, brackets, trolleys, hinges, cane bolts and binders.

Stiles and rails are made from tubing. For Series 500HT, 4x2½ in. 13-gauge tube is standard; for Series 500LT, standard industrial tube 1¾x5 in. 14-gauge is used. The large tube is used when doors are for extremely large openings or for smaller doors subject to unusually rough and hard treatment. For openings 16 ft. wide and 12 ft. high and under, receiving ordinary usage, the lighter tube will give years of uninterrupted service.

These doors are furnished with steel windows in the upper portion, although, if desired, they can be furnished with solid steel panels throughout.

Pilot doors may be provided adjacent to the jamb if specified. They are of standard Truscon industrial tube type fitted with a two cylinder spring latch and dead bolt heavy cylinder lock (or lever latch with padlock brackets) and heavy steel handles.

Besides adding permanently good appearance to a building, Truscon Accordion Steel Doors afford greatly improved weather protection and long life. Maintenance has proved remarkably low because of their rigid construction and inherent permanent qualities.

VERTICAL LIFT DOORS

TWO-SECTION TYPE

SERIES 600LT AND 600HT

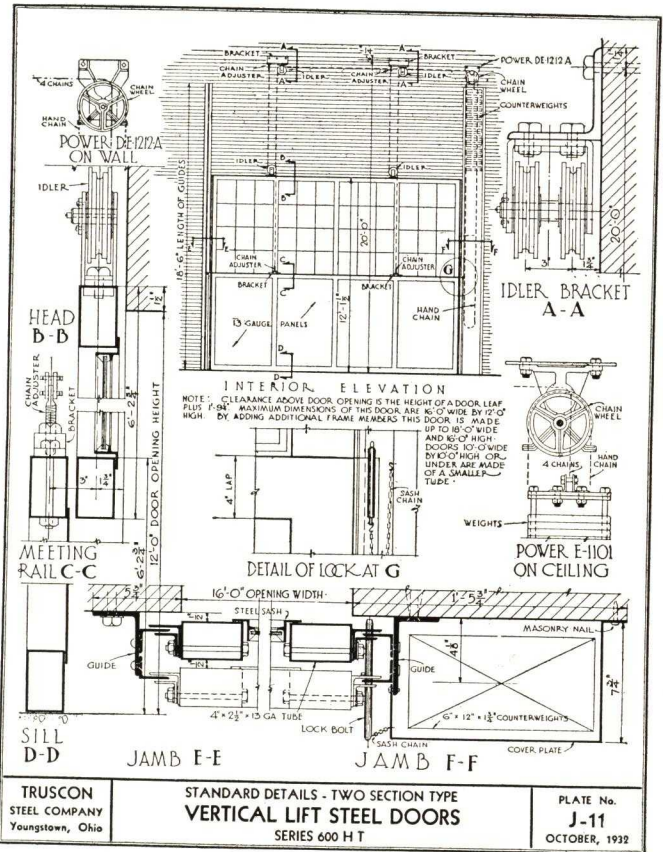
WHERE it is desirable to have the full width of the door opening without any obstruction from the doors themselves, Two-Section Vertical Lift Doors are recommended. The door consists of two leaves which move at different speeds when raised and which clear the door opening when fully open.

Two-Section Vertical Lift Doors are particularly useful for installation in warehouses, freight houses, shipping platforms, wholesale and storage buildings, ramp garages, and similar buildings. Their rugged construction and the heavy plate used makes them an effective barrier against undesired trespassers, preventing loss of merchandise.

Series 600LT—For door leaves not over 100 sq. ft. in area. Stiles and rails are of Truscon standard industrial tube. Lower panel is fitted with 16-gauge patent leveled steel sheets. Upper panel is fitted with steel windows of Truscon, standard design, or steel panels as specified. Due to the rapidity with which these light doors can be operated glazing angles are deemed necessary for holding the glass in place. Operation is by hand without the use of a mechanical power.

Series 600HT—For door leaves over 100 sq. ft. in area. Stiles and rails are of 4x2½ in., 13-gauge tube. Lower panel is fitted with 13-gauge patent leveled steel sheets. When windows are used in upper panel glass is held in place with steel window putty and spring wire glazing clips. Due to slower operation glazing angles are not considered necessary, but will be furnished if specified. Furnished with a mechanical power operated by a hand chain. Can be made of structural shapes if desired.

In providing clearance for this type of door, the distance from the top of the door frame to the ceiling or roof must be one-half the height of the door opening plus the necessary clearance for housing the operating mechanism.



BIFOLD DOORS

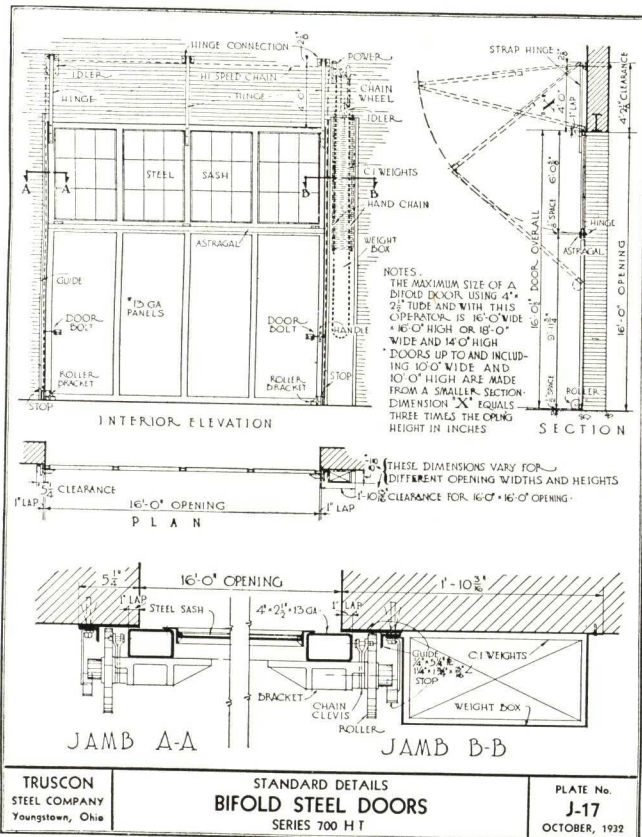
SERIES 700LT AND 700HT

THESE doors are used for freight houses, warehouses, shipping and loading platforms. They are mechanically correct and require less headroom than many other types that fold above the opening. They are counterweighted to balance in any position and operate easily.

Series 700LT—For door leaves not over 100 sq. ft. in area. Stiles and rails are of Truscon standard industrial tube. The lower panel is fitted with 14-gauge patent leveled steel sheets. Upper panel is fitted with steel sheets or windows of Truscon Standard design. Due to the rapidity with which these light doors can be operated, glazed angles are deemed necessary for holding the glass in place. Operation is by hand without the use of a mechanical power.

Series 700HT—For door leaves over 100 sq. ft. in area. Stiles and rails are of 4x2½ in., 13-gauge tube. Lower panel is fitted with 13-gauge patent leveled steel sheets. When windows are used in upper panel glass is held in place with steel window putty and spring wire glazing clips. Due to slower operation glazing angles are not considered necessary but will be furnished if specified. Furnished with a mechanical power operated by a hand chain.

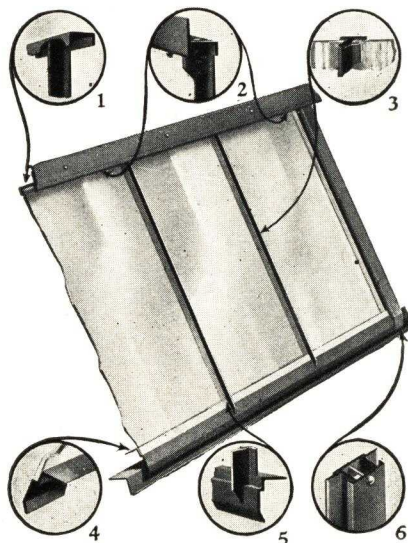
Besides adding greatly to the appearance of the building, Bifold Doors give positive weather protection.



CONTINUOUS WINDOWS

IDEALLY suited for use in industrial plants where the nature of the factory work requires frequent and rapid ventilation of the building. They are also most practical for any buildings having monitors or saw-tooth faces, or where banks of windows reach considerable heights, necessitating remote control for operation. Particularly valuable where large areas are enclosed which cannot be satisfactorily lighted through the side walls.

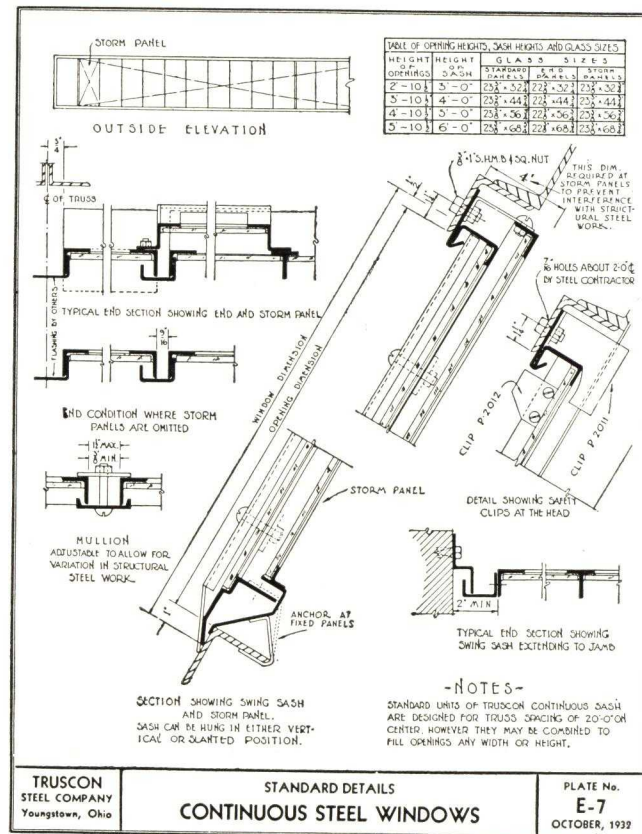
The scientific application of Continuous Windows to a building insures maximum daylight and gives absolute control of temperature and ventilation, resulting in a marked effect on increased efficiency and reduction of production costs. The quick opening and closing of glass areas by mechanical operation is invaluable to clear out gases, smoke and excessive heat and to protect against sudden change in weather.



CONSTRUCTION DETAILS

- (1) Welded Mortise and Tenon Joint—Prevents twisting.
- (2) Hinge Member—Forms continuous bearing giving perfect weathering.
- (3) Glazing Clips—Of heavy brass on vertical muntin bars.
- (4) Wide Flange—For the attachment of mechanical operator.
- (5) Mortise and Tenon Joint—Showing welding.
- (6) Vertical Expansion Mullion.

PRESSED STEEL FRAMES—Particularly well adapted for use in modern structures where the effect of massive strength must be accurately met. Made of heavy gauge copper-bearing steel, absolutely uniform and economical. Details furnished on request.



MECHANICAL OPERATORS

FOR the operation of Continuous, Pivoted, Projected and Prison Type Steel Windows are furnished in either hand or motor operated units as hereinafter described.

TENSION TYPE OPERATORS

Type P-57—Hand operation is most frequently used for runs at top or bottom hung Continuous Windows and Pivoted Steel Windows. This operator provides fast and smooth operation. The operator may be motorized if desired and will handle 185 ft. of Continuous Windows with a maximum height of 6 ft. or ventilators in 300 ft. of Pivoted Windows.

Type CP-69—This operator is designed to operate Continuous Window runs up to 375 ft. in length with a maximum height of 6 ft. It can only be used with a motor.

Type CP-83—This operator is designed to operate Continuous Window runs up to 700 ft. in length with a maximum height of 6 ft. It can only be used with a motor.

TORSION OPERATORS

Type P-515—Hand operation is commonly used on Pivoted Windows controlled either by means of hand chain or vertical

shaft and miter gear. When torsion type arms are used, runs may be operated up to 100 ft. in length. When rack and pinion type arms are used, runs may be operated up to 200 ft.

Projected ventilators can also be operated up to a limit of 60 ft. in length when torsion arms are used and 100 ft. in length when rack and pinion arms are used. In either case, two arms must be furnished per vent.

Type P-289—With the use of Torsion operators it is only possible to motorize the rack and pinion type using the P-289 power. This type of operator will operate ventilators in 300 ft. of Pivoted Windows.

SCREW TYPE OPERATORS

Type CP-259—This operator is designed for operation of Continuous Windows in power houses where one row of windows is located above the other and may be used for operating one or more bays. This operator is screw type and in all cases must be motorized.

Type CP-419—This operator is designed especially to operate Prison Type Windows and is a vertical screw design, and operated by means of crank handle attached to the screw power.

TRUSCON STEEL COMPANY—YOUNGSTOWN—OHIO—U.S.A.

“CLERESPAN” TRUSSES

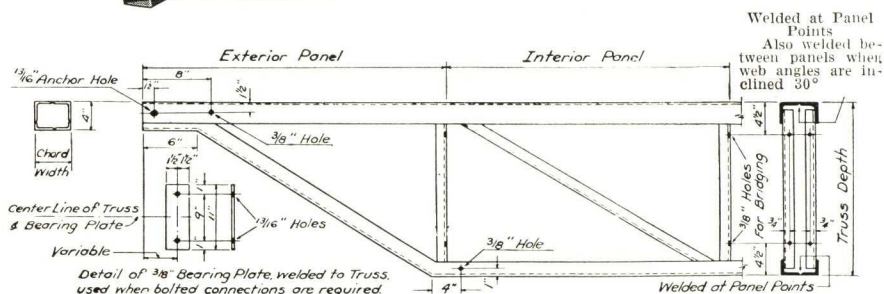
TRUSCON “Clerespan” Trusses are in reality box type lattice girders having a double web system thus having the most economical and efficient distribution of metal and resulting in the most rigid type of structural unit.

Truscon “Clerespan” Trusses when employed in floor construction can be used advantageously in buildings of all types of occupancies regardless of their location. In many types of buildings their use will automatically eliminate all columns from the structure with the exception of those in the outer walls. Greater floor areas are thus provided without obstructing columns than has ever heretofore been accomplished. When used in roof construction, “Clerespan” Trusses meet every requirement of every type of building.



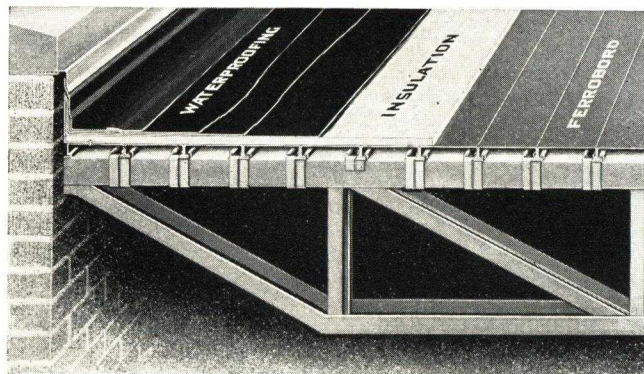
“Clerespan” Trusses

For spans up to 60 ft.
Eliminate columns



ADVANTAGES

- Can be used in floor and roof spans up to 60 feet.
- Provide greater areas of unobstructed floor space.
- Floor areas unobstructed by columns give greater flexibility in arrangement of interior equipment.
- Securely bridged by means of “Strut” or cross bridging, securely bolted in place.
- A fireproof type of construction quickly obtained.
- Possessing unusual lateral stiffness.
- Designed as a Pratt Type Truss.
- All compression stresses reduced to provide for local as well as direct bending.
- Automatic electric resistance pressure welding employed in all joints.
- Made entirely of hot rolled structural angles.
- A box type lattice girder having a double web system.
- Permits the passage of pipes and conduits.
- Being underslung in design, they are easily erected.



“Clerespan” Trusses with Ferrobord Steeldeck Roof

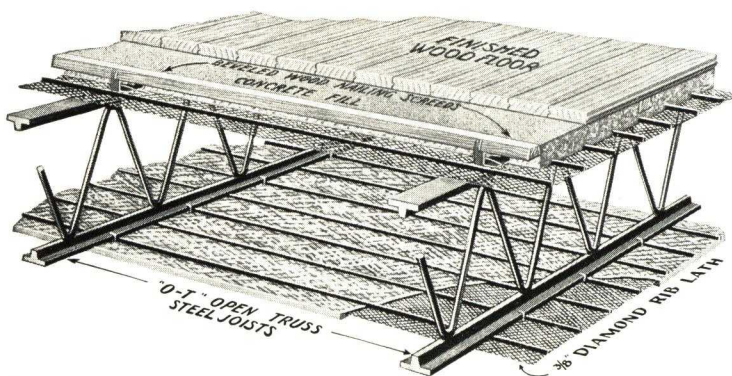
“O-T” OPEN TRUSS STEEL JOISTS

Designed and manufactured in accordance with the specifications of the Steel Joist Institute and the Simplified Practice Recommendations (S.P.R. 9430) on Open Web Steel Joists as issued by the U. S. Department of Commerce, Bureau of Standards.

Top and bottom chords are of wide tee-shaped members to provide the greatest resistance to buckling strains. Bottom tee is continuous to the bearings, where it is welded with the web plate and top chord to form a solid I-beam. Web members are continuous from end to end so that stresses are transmitted perfectly.

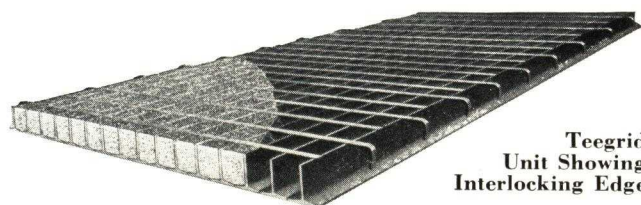
The underslung design of the bearing permits maximum headroom under the supporting girders. The open web allows the passage of pipes and conduits of any number and in any direction.

For Economical
and Fireproof Floors



Truscon Open Truss Steel Joist Construction with Finished Floor of Wood Secured by Means of Screeds placed at Right Angles to the Joists and Elevated to Provide for Concrete Underneath

FLOOR SYSTEMS



Teegrid
Unit Showing
Interlocking Edge

TEEGRID BRIDGE FLOORS

(Patent Applied For)

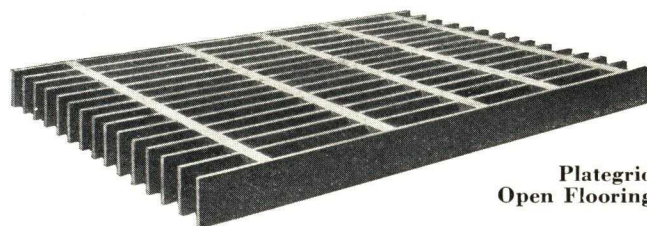
THIS floor system consists of load-bearing T-sections and load distributing bars at right angles to each other, with the intervening spaces filled with concrete vibrated into place.

The fabrication of Teegrid involves the welding of T-sections, flange to flange, with the stems extending upward.

Triangular Traffic bars are then pressure welded to the vertical stems, at 4-in. centers, with the flat side of the bar level with the top edge of the "T" stems, to form a rigid, solid slab unit.

Advantages—An engineering design capable of carrying all types of specified bridge loading. Maximum carrying capacity with minimum dead weight. Light weight effects considerable saving in bridge structure. Absolute continuity of material and load distribution throughout entire structure. Elimination of field forms for concrete wearing surface. The erection of Teegrid units provides an immediate safe working floor. Erected by the same labor which erects the balance of bridge steel. Concrete can be poured and vibrated in place as soon as Teegrid is erected. A wearing surface armored with steel, offering great resistance to traffic abrasion.

Used for bridge and heavy duty floors of all kinds.



Plategrid
Open Flooring

PLATEGRID OPEN FLOORING

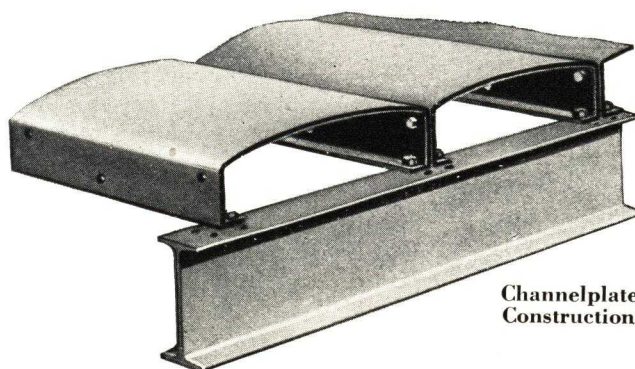
(Patent Applied For)

An all-steel grating developed for use as open type flooring, to permit the passage of light and air to spaces above or below the floor. Its construction is simplified—permanence, safety, strength, cleanliness, efficiency and economy are features. Being electro-forged into a unit, Plategrid offers obvious advantages over ordinary types of gratings.

Plategrid consists of a series of bars of variable depth and thickness placed parallel and on edge at definite intervals. Along the top of the parallel bars, and at right angles to them special cold-drawn triangular bars are electro-forged into the parallel bars, so that the surfaces are level with each other. When the main bars are two inches or greater in depth, supplemental cross bars are electro-forged into the bottom in the same manner as at the top, but at greater spacings.

Manufactured in four standard types in depths of $\frac{3}{4}$ to $2\frac{1}{4}$ in. and lengths of 2 ft. to 16 ft.

Plategrid open type steel flooring is used for area gratings, manhole coverings, cooling floors, walk-ways and platforms for boiler rooms, power houses, pumping stations, water works, filtration and sewage disposal plants, oil refineries, gas plants, foundries, stair treads, sidewalk grating for subways and many other uses.



Channelplate
Construction

CHANNELPLATE FLOORS

(Patent Applied For)

DESIGNED for medium and heavy loading, offering important economies, especially where the total floor load exceeds 150 lbs. per sq. ft.

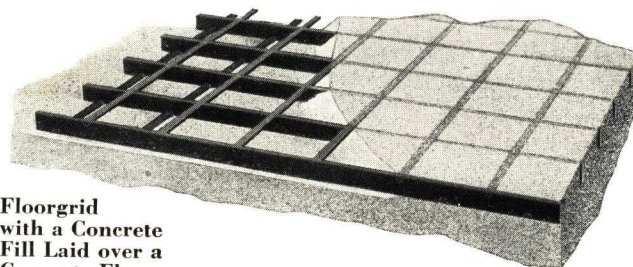
This structural steel floor consists of a series of Channelplate sections bolted web to web and with the flanges bolted, riveted or welded at the ends of the Channelplate to the structural supporting frame.

The Channelplates are pressed from open hearth steel plates of varying thicknesses. When the web of the Channelplate is bolted to the web of the adjacent section, the double web and flanges form an I-beam section that occurs at intervals of 20, 22 or 24 in.

The top flange between I-beams is arched with a standard crown height of $\frac{3}{4}$ in., thereby providing unusual stiffness and a high resistance to impact or moving loads. A wearing surface of concrete reinforced with welded steel fabric, asphalt mastic, or other materials as desired, is applied directly to the Channelplate construction.

Advantages—Channelplate floors are from 25 to 60 lbs. per sq. ft. lighter than the ordinary types of floors used for medium or heavy duty loadings. The result is a worthwhile saving in the structural steel frame required for its support and in the total weight of the structure.

Channelplates are self-supporting—there is no need of centering or other temporary supports. As soon as supporting frame has reached floor level, the Channelplates can be laid. They are erected by the same labor, and at the same time, as the structural steel and can be laid temporarily, if desired, and used as working or storage platforms.



Floorgrid
with a Concrete
Fill Laid over a
Concrete Floor

FLOORGRID REINFORCED FLOORS

(Patent Applied For)

This product has been developed for use where abrasion and wear are severe and where continuous service from floors is necessary. It consists of rectangular straight bars spaced at definite intervals, with triangular cross bars electro-forged into them to form a steel armored wearing surface that is unequalled for heavy duty. Floorgrid is designed to function purely as a wearing surface, although it does impart considerable strength to the construction. The steel armoring protects against the wear of rolling or dragging loads, as well as against the destructive action of loading or unloading heavy articles, for the unit construction of Floorgrid positively transmits the force of the blow over a large area.

Three standard types furnished in lengths of 8 ft., $\frac{3}{4}$, 1, $1\frac{1}{2}$ or 2 in. deep in widths slightly over 3 ft. 4 in.

FLORETYPE CONSTRUCTION

LOCKTYPE

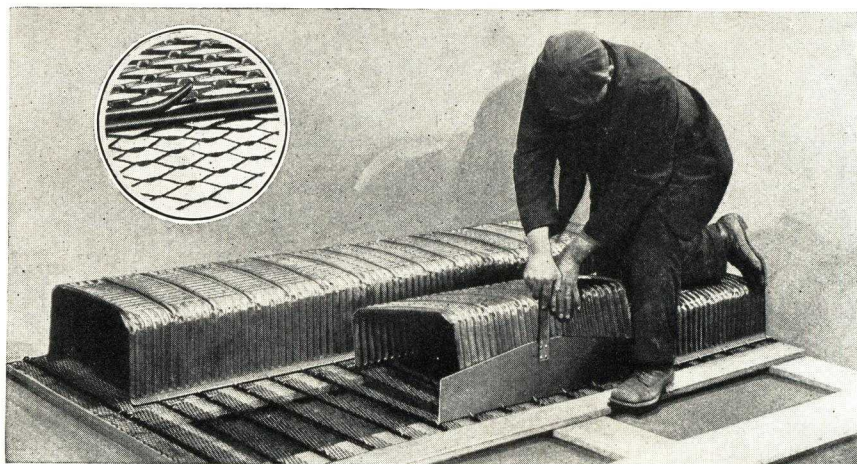
LOCKTYPE is an improved Floretyle Construction consisting of deep ribbed steel Floretyle whose flanges are locked into the prongs of the ribs of Locktype Lath.

Locktype Lath is furnished in rolls 100 ft. long x 2 ft. wide, the ribs running in the direction of the 2 ft. width. It consists of ribs $\frac{3}{8}$ in. high spaced 4.8 in. center to center with a diamond mesh between the ribs. At the proper distance from the ends, each rib has a prong punched upward (see illustration). Locktype Lath is shipped in rolls with the ribs turned inward. After it rolls out on the form, the ribs and prongs are on the upper side for immediate placing of the ribbed Floretyle.

Locktype Construction is easily and speedily erected. It saves in concrete and plastering cost and insures true and straight concrete joists with positive attachment of the ceiling in reinforced concrete construction. It

insures constant width of concrete joists, making unnecessary the use of any spacers, and saves all expensive nailing of the steel Floretyle to the form boards.

As used with Locktype Lath, all heights of ribbed Floretyle are 20 in. wide at the base, exclusive of the flanges along the bottom edges.



FERROCLAD STRUCTURAL PANELS

STEEL or non-ferrous metal faced one or both sides with insulated, acoustic, fire-resisting or rigid type cores, manufactured in panel sizes up to 4 ft. x 12 ft. and in any thickness from $\frac{1}{8}$ in. upwards. Metal faced and core material cemented together under hydraulic pressure with a non-corrosive, waterproof cement capable of withstanding temperature between minus 110 degrees to 850 degrees, without giving off odors or having any deterioration.

PANEL TYPES

Ferroclad Insulated Structural Panels—Internal conductance .33 B.t.u. per square foot per hour per degree of temperature difference. Can be used between temperatures of 0 and 250 degrees Fahrenheit.

Ferroclad Acousti-Panels—Internal conductance .33 B.t.u. per square foot per hour per degree of temperature difference. Sound absorption co-efficient .30, .47 or .70.

Ferroclad Rigid Structural Panels—Small insulation and acoustic value. Structural value to meet conditions.

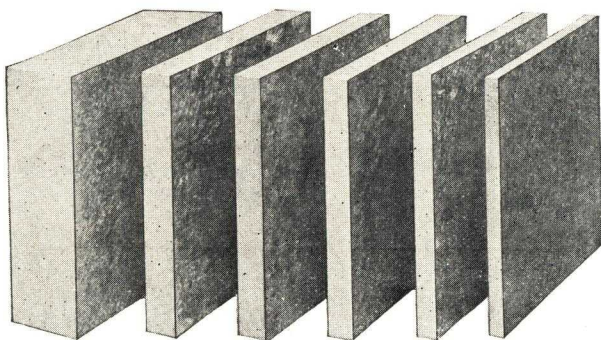
Ferroclad Low Temperature Panels—Internal conductance from .20 to .30 B.t.u. per square foot per hour per degree of temperature difference. Moisture resisting. Light in weight. Structurally very good. Can be used up to 1600 degrees Fahrenheit.

Ferroclad Fireproof Panels—Internal conductance .50 B.t.u. per square foot per hour per degree of temperature difference. Solid structural panel. Moisture proof.

Metal faces can be furnished plain, prepared for lacquers or enamels, or finished with any type of wood veneer.

Edge and joint construction can be fabricated into panels to meet particular conditions.

All panels can be waterproofed without affecting insulation, acoustic and fireproofing qualities.

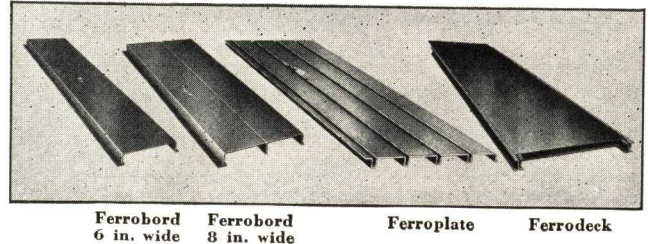


Recommended for:

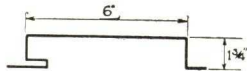
Dryers and Kilns, Low and High Temperature
Rigid Radiator Enclosures and Conduits
Insulation Backs for Radiators
Insulated Ceilings, Wall or Roof Construction
Air Duct Construction
Refrigerators and Cold Storage Plants
Blower and Fan Panel Construction
Panels for Oven Construction
Panels for Residential Furnace and Boiler Construction
Panels for Air Cleaning, Cooling and Humidifying Equipment

STEELDECK ROOFS

STEELDECK Roofs, insulated to any degree and waterproofed, are of a broad and general usefulness. They are particularly adaptable to theatres, gymnasiums, schools, auditoriums, public halls and industrial buildings requiring large floor areas free from supports and obstructions. Steeldecks are plates of copper-bearing steel of standardized lengths and widths, with ribs formed longitudinally in the plates. The ribs are on the underside of the plates and the top is a smooth level surface to receive insulation and waterproofing. They can be used to advantage on straightway, flat, pitched and curved roofs with a minimum radius of 40 ft.



FERROBORD

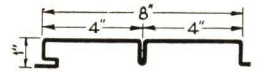


This roofdeck, 6 or 8 in. wide, is so formed that each sheet firmly interlocks with the adjoining sheet to form a continuous deck over the entire roof.

Ferrobord 6 in. wide is used for spans between 6 and 10 ft. Made in 20 and 18 gauge with ribs either 1 1/4 or 1 3/4 in. deep depending upon the load.

Any length may be supplied and butt joints may occur between supports by using butt clips.

Ferrobord 8 in. wide is used when spans are between 2 ft. and 5 ft. 6 in. Made in 24 and 22 gauge with ribs 1 in. deep. Standard length 12 ft. Laps must occur over supports.



Welding Ferrobord—This deck is especially adaptable for the arc welding process of erection because the flat, bottom flange of the rib presents an extremely easy and simple welding condition. The operation is done from above, with each weld readily accessible.

FERROBORD SECTIONS FOR DIFFERENT SPANS AND ROOF LOADINGS

Type of Ferrobord	Span in feet	Total dead load and live load per square foot											
		25 lbs.		30 lbs.		35 lbs.		40 lbs.		45 lbs.		50 lbs.	
		Gauge	Depth	Gauge	Depth	Gauge	Depth	Gauge	Depth	Gauge	Depth	Gauge	Depth
6" wide	6' 0"	20	1 1/4"	20	1 1/4"	20	1 1/4"	20	1 1/4"	20	1 1/4"	20	1 1/4"
6" wide	6' 6"	20	1 1/4"	20	1 1/4"	20	1 1/4"	20	1 1/4"	20	1 1/4"	20	1 1/4"
6" wide	7' 0"	20	1 3/4"	20	1 3/4"	20	1 3/4"	20	1 3/4"	20	1 3/4"	20	1 3/4"
6" wide	7' 6"	20	1 3/4"	20	1 3/4"	20	1 3/4"	20	1 3/4"	20	1 3/4"	20	1 3/4"
6" wide	8' 0"	20	1 3/4"	20	1 3/4"	20	1 3/4"	20	1 3/4"	20	1 3/4"	18	1 3/4"
6" wide	8' 6"	20	1 3/4"	20	1 3/4"	20	1 3/4"	20	1 3/4"	20	1 3/4"	18	1 3/4"
6" wide	9' 0"	20	1 3/4"	20	1 3/4"	18	1 3/4"	18	1 3/4"	18	1 3/4"	18	1 3/4"
6" wide	9' 6"	20	1 3/4"	18	1 3/4"	18	1 3/4"	18	1 3/4"	18	1 3/4"	18	1 3/4"
6" wide	10' 0"	18	1 3/4"	18	1 3/4"								

The above table has been computed on the following assumptions:

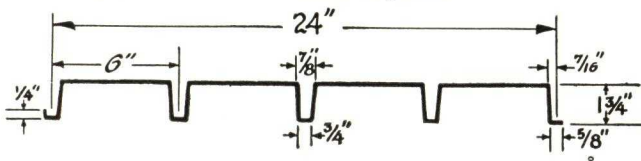
Maximum unit fiber stress 18,000 pounds per sq. inch.

Maximum allowable deflection is one two-hundred and fiftieth ($\frac{1}{250}$) of the span in inches based on either a uniform or an equal concentrated load.

Dead load of Truscon Ferrocooustic with insulation, built-up roofing and acoustical panels approximately five (5) to nine (9) pounds per sq. foot, according to the type of material used.

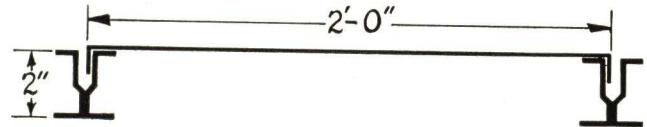
FERROPLATE

18, 20, 22 or 24 gauge copper-bearing sheets or galvanized sheets (before fabrication) 24 in. wide; ribs 1 3/4 in. deep; maximum length, under 12 ft. Welded to purlins.



FERRODECK

An assembly of sub-purlins and reinforced roof sheets. Sub-purlins, 2 in. deep, 18 gauge. Roof sheets, 2x4 ft., 18 or 20 gauge; substantially reinforced with angles every 16 in. on center.



FERROCOUSTIC

Ferrocooustic Roofdecks provide all the advantages of Steeldeck with the additional feature of acoustical correction for auditoriums, large rooms, gymnasiums and similar places.

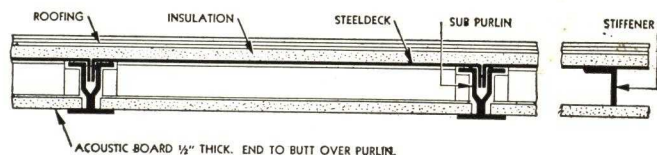
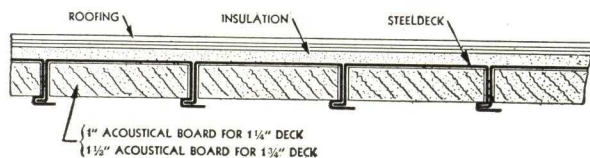
FERROBORD, 6 in. wide, with acoustical treatment, consists of panels of any commercial acoustical board fitted between the ribs of these roofdecks. The flanges of the ribs form a positive mechanical support. These ribs are either 1 1/4 or 1 3/4 in. deep, allowing either 1 or 1 1/2 in. of acoustical treatment to be used. Sheets with acoustical board inserted are welded to purlins, eliminating metal clips and adding strength to the construction.

The Ferrobord construction with the Ferrocooustic treatment also makes an excellent, light-weight, quiet floor construction of

minimum thickness when surfaced with cement, magnesite, rubber tile, linoleum or other materials, for its structural design enables it to carry unusually heavy loads.

FERRODECK with acoustic board applied makes also an excellent installation. The sub-purlins are secured to the supporting roof framing with clips or by the welding process.

The acoustic board, which is 1/2 in. thick, is laid on the bottom flanges of the sub-purlins, then the fabricated roof sheets are placed so that the flanged-over edges of adjacent sheets fit side by side into the openings along the tops of the sub-purlins. The acoustical board automatically is held firmly in place by the stiffening angles in the roof sheets.



STANDARDIZED STEEL BUILDINGS AND STRUCTURAL STEEL

THESE buildings involve only the use of Truscon products. Their variety of types and sizes, and the option of steel walls, Ferroclad Walls, or walls in combination with brick, concrete or stucco, allow a wide latitude in the selection of the individual structure.

Structural Steel for Framing—Conforms to accepted practice and is designed to support standard loads.

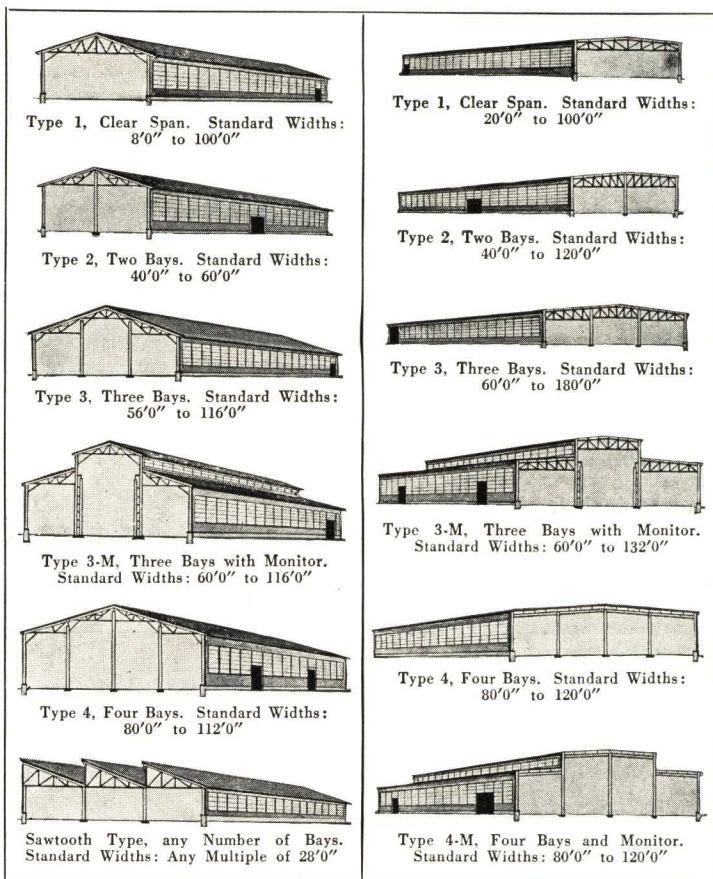
Steel Windows—Standard Steel Windows and Operators for steel windows are used throughout.

Steel Doors—Standard swing or slide types for openings up to approximately 9 ft. square; other Truscon doors for larger openings.

Roofdeck—Truscon Ferrodeck, insulated to any degree and waterproofed with standard roofing.

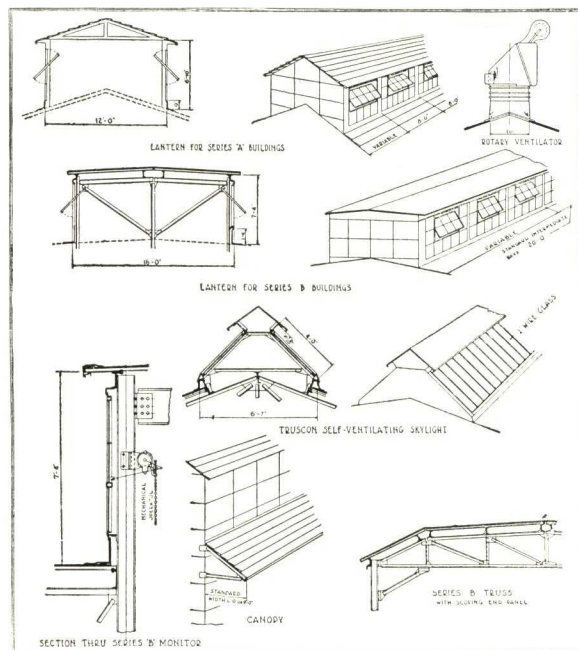
Series "A" Buildings—Pitched Roof Types: Lengths—multiples of 2 ft.; heights—8 ft. 1 in. or greater, varying in multiples of 2 ft. 8 in.; standard curb heights—8 in., 16 in. and 24 in.; standard lantern—12 ft. wide, 6 ft. 10 in. high.

Series "B" Buildings—Flat Roof Types: Lengths—multiples of 2 ft.; heights—11 ft. 5 in. to 32 ft. 9 in. or greater, varying in multiples of 2 ft. 8 in.; standard curb heights—8 in., 16 in. and 24 in.; standard lantern—16 ft. wide, 8 ft. high.



Series "A"—Pitched Roofs

Series "B"—Flat Roofs



Details of Standardized Accessories

[Truscon Engineers welcome the opportunity to collaborate with architects and engineers in developing the most efficient use of structural steel and complete steel buildings]

BUILDINGS WITH FERROCLAD WALL PANELS

FERROCLAD Wall Panels are made of a fibrous insulated board, 1 in. thick, the outer face being covered with a 20 ga. sheet of copper-bearing steel, the inner face with a 24 ga. sheet of copper-bearing steel. Each sheet is securely bonded to the insulating board. Ferroclad Walls have great structural strength and offer a resistance to temperature change equal to that of a 12-in. masonry wall.

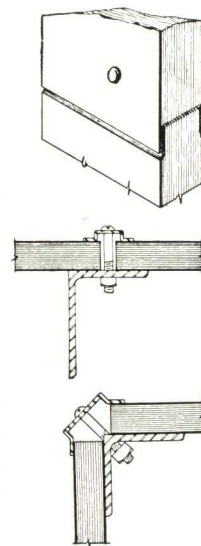
The nominal size of the standard wall panel is 4-ft. wide and 2-ft. 8-in. high. When necessary to obtain variation in the length of the building or location of doors, panels 2-ft. wide may be used.

Edges of panels are sealed to protect the insulation from moisture. Steel sheets are galvanized or shop painted with standard gray Bar-Ox paint.

Horizontal Joint—A system of positive weathering and alignment has been developed to take care of the joint as one panel is placed above another. Galvanized rivets are used to prevent accidental spreading of insulation. Rivets are kept back far enough from the vertical edges of the panels to clear studs and cover plates.

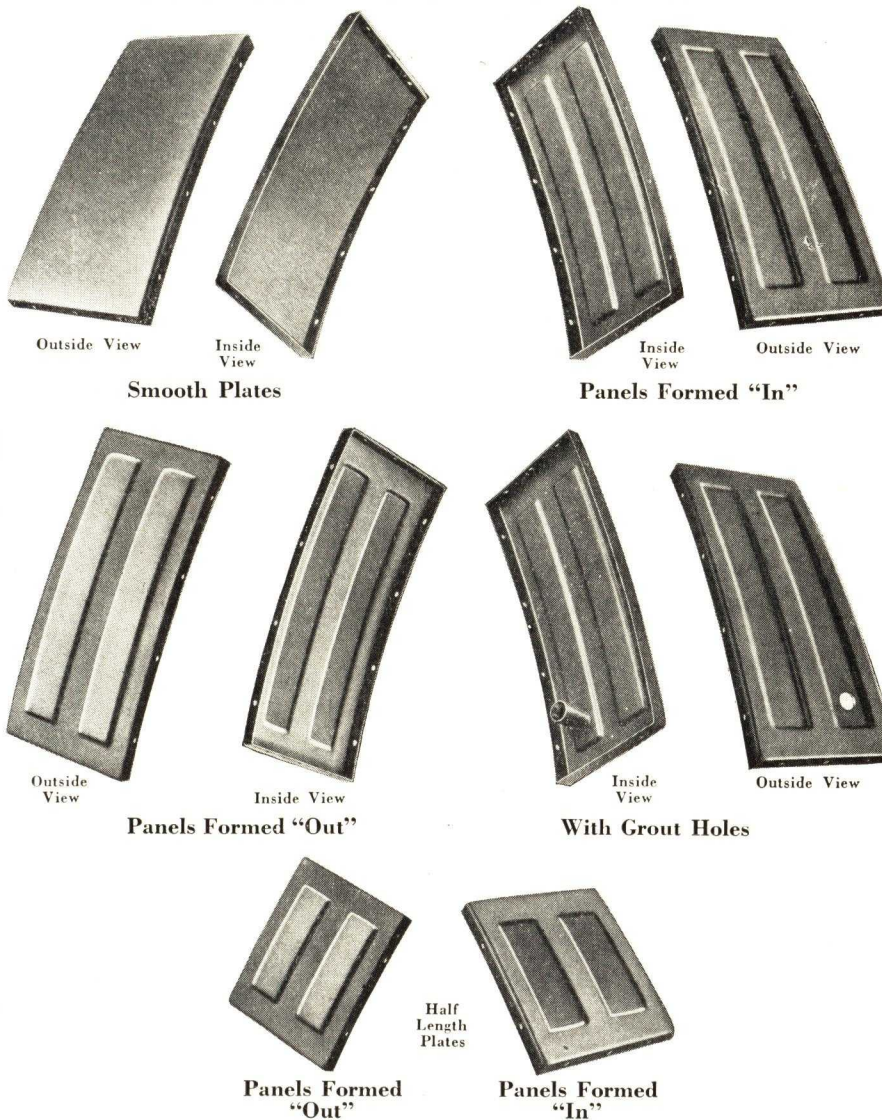
Vertical Joint—The vertical joint is made by clamping the edges of adjoining panels between the structural steel stud and a cover plate. Note that the cover plate bears on the panels with a flat surface for weathering.

Building Corner—A special corner cover plate is used to clamp the panels to the corner stud. Note that the building dimensions in multiples of 2-ft. are taken at the outside line of the studs.



STEEL LINER PLATES

(Licensed under U. S. Patents: No. 1778606 and No. 1757813)



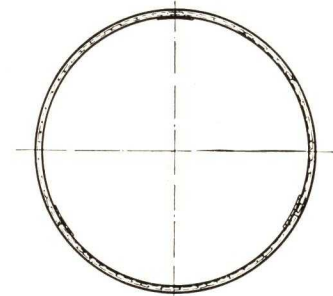
THREE GENERAL TYPES

- (1) Smooth Plates without stiffening panels for caissons, assembled and sunk from ground level, requiring a minimum of skin friction.
- (2) Plates strengthened by embossed *stiffening panels formed "In,"* for tunnels and shafts permitting maximum economy in lining materials.
- (3) Plates strengthened by embossed *stiffening panels formed "Out,"* for various uses where maximum strength and rigidity are essential.

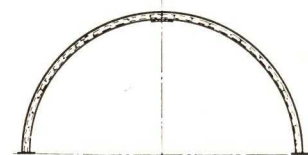
DIMENSIONS

One standard width: 16-in.
 Two standard lengths: 37 $\frac{1}{8}$ -in. and 36-in.
 The 37 $\frac{1}{8}$ -in. size is used where the diameter is in whole feet, one plate being required for each foot of diameter. Half Plates permit diameters in multiples of 6 in. The 36-in. size is used for certain other odd diameters. Half Plates are also available.
 Grout holes, tapped for 1 $\frac{1}{2}$ -in. pipe, provided where required.

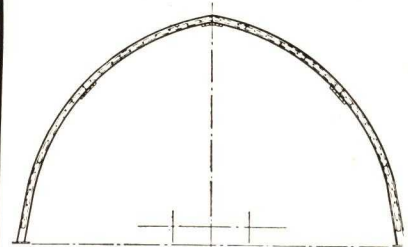
Typical Standard Contours of Large Tunnels Using Ribbed Construction Between Courses of Plates



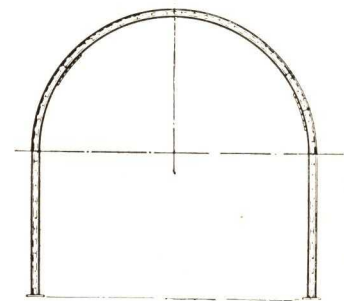
Circular



Semicircular



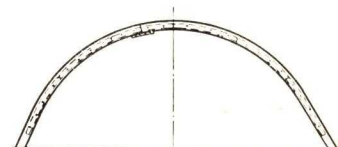
Bee Hive



Arch Roof with Straight Sides



Arc



Arch with Straight Sides

TRUSCON STEEL COMPANY - Cleveland, Ohio
PRESSED STEEL DIVISION

TRUSCON

EXECUTIVE OFFICES AND MAIN PLANT

YOUNGSTOWN, OHIO

FACTORIES: CLEVELAND, CANTON, DETROIT, LOS ANGELES, WALKERVILLE, JAPAN, BUENOS AIRES

THE TRUSCON LABORATORIES, DETROIT

PRESSED STEEL DIVISION, 6100 TRUSCON AVENUE, CLEVELAND

BERGER BUILDING DIVISION, CANTON, OHIO

FOREIGN TRADE DEPARTMENT, 155 E. 44TH STREET, NEW YORK

■ ■ ■ ■ ■

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BALTIMORE, MD., 330 W. 24TH STREET
BIRMINGHAM, ALA., 1105 MARTIN BUILDING
BOSTON, MASS., 38 CHAUNCEY STREET
BUFFALO, N. Y., 402 SIDWAY BUILDING
CHARLESTON, W. VA., 1564 DIXIE STREET
CHATTANOOGA, TENN., 1222 JAMES BUILDING
CHICAGO, ILL., 201 NO. WELLS STREET
CINCINNATI, OHIO, 1026 DIXIE TERMINAL BLDG.
CLEVELAND, OHIO, 1304 BUILDERS' EXCHANGE BLDG.
COLUMBUS, OHIO, 1000 ATLAS BUILDING
DALLAS, TEXAS, 414 CONSTRUCTION BUILDING
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DES MOINES, IOWA, HUBBELL BUILDING
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FORT WAYNE, IND., 426 CAL-WAYNE BUILDING
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HARRISBURG, PA., 600 NO. SECOND STREET
HOUSTON, TEXAS, 731 A. M. & M. BUILDING
INDIANAPOLIS, IND., 812 UNION TITLE BUILDING
JACKSONVILLE, FLA., 3RD AND CLARK STREETS
KANSAS CITY, MO., 101 W. 11TH STREET
LITTLE ROCK, ARK., 1020 E. 13TH STREET
LOS ANGELES, CALIF., 5480 E. SLAUSON AVENUE
MEMPHIS, TENN., 263 WALNUT STREET

MILWAUKEE, WIS., 1200 STRAUS BUILDING
MINNEAPOLIS, MINN., 354 BAKER BUILDING
NEWARK, N. J., 605 BROAD STREET
NEW HAVEN, CONN., 42 CHURCH STREET
NEW ORLEANS, LA., 1042 CANAL BANK BUILDING
NEW YORK, N. Y., 155 E. 44TH STREET
NORFOLK, VA., 22ND AND MANTEO STREETS
OKLAHOMA CITY, OKLA., 716 W. GRAND AVENUE
OMAHA, NEB., 5606 JONES STREET
PHILADELPHIA, PA., 906 ARCHITECTS BUILDING
PHOENIX, ARIZ., 222 LUHRS BUILDING
PITTSBURGH, PA., 523 GRANT BUILDING
PORTLAND, OREGON, 2139 NO. KERBY AVENUE
RICHMOND, VA., 932 CENTRAL NATIONAL BANK BUILDING
ROSWELL, N. M., COUNTY ENGINEER'S OFFICE
ST. LOUIS, MO., 1005 ST. LOUIS MART BUILDING
SALT LAKE CITY, UTAH, 1526 SO. WEST TEMPLE STREET
SAN ANTONIO, TEXAS, 902 TRAVIS BUILDING
SAN FRANCISCO, CALIF., 74 NEW MONTGOMERY STREET
SCRANTON, PA., 1717 MULBERRY STREET
SEATTLE, WASH., 217 LLOYD BUILDING
SYRACUSE, N. Y., 540 GURNEY BUILDING
TAMPA, FLA., MORGAN AND BELL STREETS
TOLEDO, OHIO, 312 RICHARDSON BUILDING
WASHINGTON, D. C., 938 INVESTMENT BUILDING

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MILWAUKEE, WIS.
NEWARK, N. J.

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NORFOLK, VA.
PHILADELPHIA, PA.
PORTLAND, OREGON
SAN FRANCISCO, CALIF.
ST. LOUIS, MO.
ST. PAUL, MINN.

DETROIT STEEL PRODUCTS COMPANY

Manufacturers of Fenestra Steel Windows and Doors and Holorib Steel Roof Decks and Steel Floor Forms

2250 East Grand Boulevard
DETROIT, MICH.

Fenestra Industrial Products include steel windows of various designs, among them Horizontally Pivoted, Projected In or Out, Continuous Monitor Windows, and Detention Windows. As a means of opening, closing and locking these windows, a complete line of Fenestra Operating Devices may be secured, varying from the comparatively simple hand control of a single ventilator to mechanical control of multiple runs by means of electric power.

Complementing the Fenestra Window Products is a

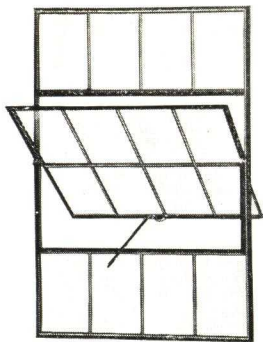
Fenestra

complete line of Fenestra Industrial Doors, including Swinging, Sliding, Folding and Lifting Types of all types and sizes, from a single swing door for a 3x7 ft. opening to a Fenestra-Byrne Hangar Door 150 ft. wide.

Also available are Fenestra-Holorib Roof Decks, including Sanacoustic Holorib for use where sound deadening is important and Fenestra-Holorib Floor Forms for use as concrete reinforcements and forms for poured concrete floors, balcony steps, arena seats, pipe ducts and the like.

Pivoted and Projected Windows

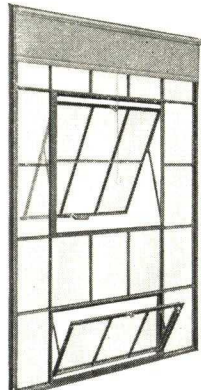
Pivoted Windows for industrial and commercial buildings are standardized in 12x18-in. and 14x20-in. glass lights and in popular types and sizes



Horizontally Pivoted Windows

and may be secured from various warehouses. Ventilators usually are pivoted 2 in. above center, and are opened, closed and locked either by a cam handle and stay as shown, or by mechanical operator.

Commercial projected windows are similar in every

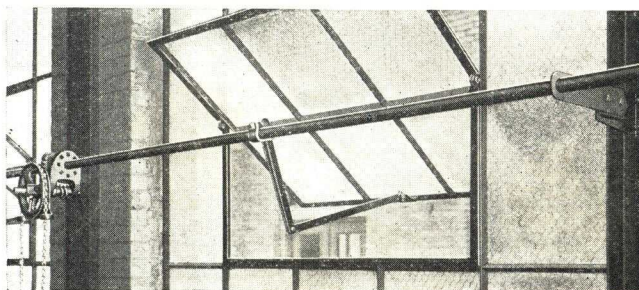


Commercial Projected Windows

way to pivoted windows except that ventilators are equipped with side arms and slide down from the top while opening out at the bottom or tilt in at the top while sliding up from the bottom. This construction facilitates screening, shading and washing from the inside of the building.

Subject to certain limitations, both pivoted and commercial projected windows may be supplied with Underwriters' label.

Worm and gear operator is designed to control either pivoted or projected windows in single or multiple runs through chain wheel motivation of a cast iron worm equipped with ball thrust bearings, this worm operating a cast iron segmental worm-gear. The hub of the gear is reamed to fit a power transmission line to which are attached operating arms connected with the ventilators.



Worm and Gear Operator

Continuous Monitor Windows

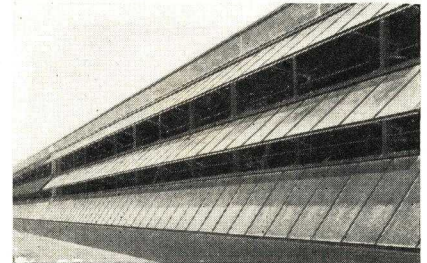
Fenestra Continuous Windows are particularly designed for use in monitor and sawtooth roof construction where the plane of the window is on a slope. They are also used in vertical planes. This type provides an easily and rapidly operated continuous opening from one end of the building to the other, and a weather protected canopy at all times.

All sections are specially designed tees and angles, the sill having a long downstanding leg, bent at the end to act as a drip.

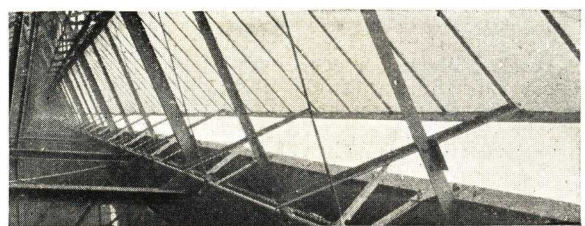
Panels are joined end to end by splice plates bolted to head and sill members midway between muntins, thus forming one continuous window of practically any desired length. Stationary panels 2 ft. wide are provided between sections and stationary panels 1 ft. wide are provided at the ends of swing sections next to the ends of the building.

Continuous top-hung windows are hung on malleable iron butts with $\frac{3}{8}$ in. brass pins spaced 4 ft. apart on centers. Glass panes extend the entire height of the window panel, each pane being, roughly, about 2 ft. wide. One-quarter inch wire glass set in steel sash putty, glazed from the outside and held by glazing clips, is recommended.

Fenestra Continuous Operator is designed to operate continuous windows either manually or electrically in single or multiple banks. Heavy construction and extreme care in assembly give this operator unusual strength and reliability. The power may be located at either end of the run, not closer than 20 ft. to the end. Operator arms are spaced about 10 ft. on centers.

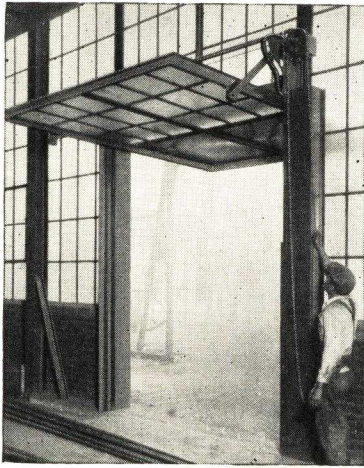


Continuous Windows in Monitor



Continuous Operator

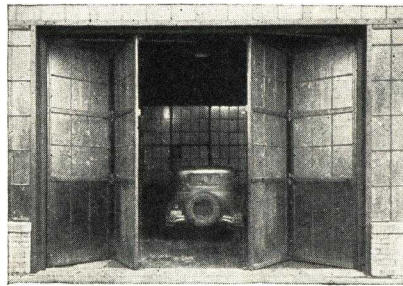
FENESTRA COMMERCIAL AND INDUSTRIAL TYPE DOORS



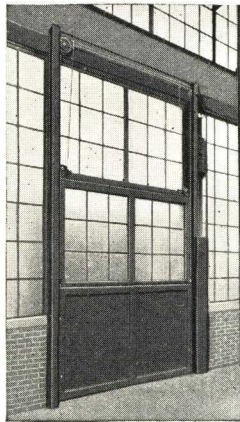
Fenestra-Byrne Type A Door

Easy, high speed operation and weathertightness are fundamental characteristics of Fenestra door designs. Efficient electrical operators can be supplied for remote control, if desired, or other special conditions of service.

There is a Fenestra door for transportation terminals, crane runways, hangars, piers, warehouses and all types of industrial and engineering structures. Fenestra engineers are prepared to respond promptly with specifications on high speed door equipment for special openings up to 150 ft. wide x 28 ft. high.



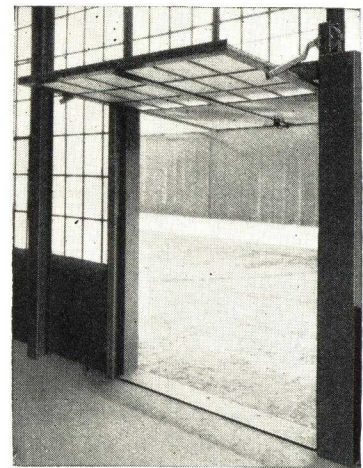
Accordion Doors



Vertical Lift Door



Bifold Door



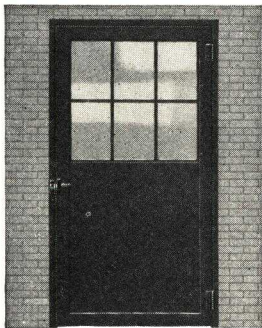
Canopy Door

The Fenestra-Byrne Type A Door is especially recommended for balanced door equipment and high speed operation, either by hand or electrical power, and is available for openings 10 ft. wide x 10 ft. high up to 40 ft. wide x 20 ft. high. It may be installed in the conventional types of building construction without expensive alterations or additions.

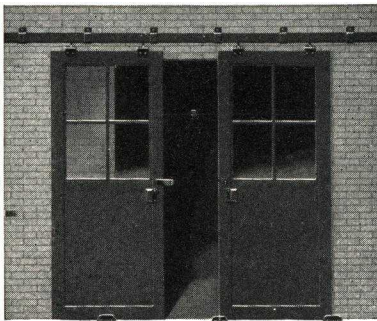
Bifold Doors, Vertical Lift Doors and Accordion Doors are also available as the needs of special types of construction may dictate. Full information, specifications and details will be supplied on request.

Swinging and Sliding Doors

Fenestra Light Industrial Doors in both swinging and sliding type are carried in standard sizes in warehouse for immediate shipment. They are meeting the widely established demand for



Light Industrial Swing Door



Light Industrial Double Sliding Doors

a door of clean, neat appearance for either entrance or partition openings.

Rails and stiles are pressed steel tubular sections, mitered at corners and solidly welded over heavy steel reinforcements. The lower panels are filled with solid steel kick plates and the upper panels have sash muntin bars neatly membered and welded directly into the stiles and rails.

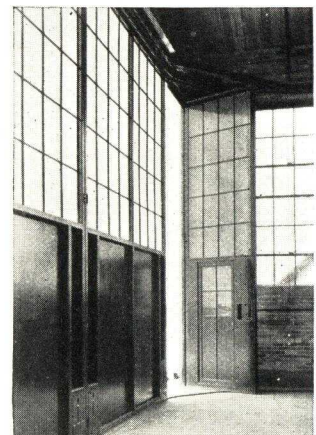
This construction results in a clean finish unusual to this class of door, and standardized production brings prices in line with doors of less exacting specifications.

Doors can be fitted with masterkeyed cylinder locks, panic bolts and door checks. Special sizes can be furnished when required.

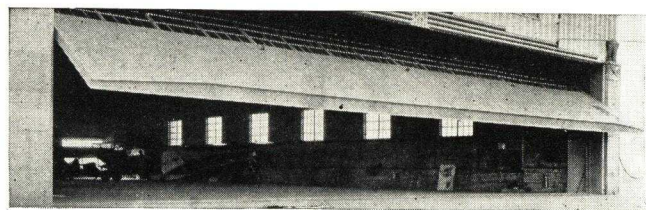
Airplane Hangar Doors

For Airplane Hangars we strongly recommend the Fenestra-Byrne Type B Door built entirely in one piece to fill openings up to 28 ft. high by 150 ft. wide. Hand or electric operation with minimum effort in the shortest possible time. When open it forms a canopy across the entire door opening. It requires no floor tracks, occupies no floor space. Its first movement is a vertical lift of 8 in., clearing snow or ice outside. Operation is by means of steel cables spaced about 20 ft. on centers, extending up the outside of the door and carried over roller bearing sheaves around a central power drum and thence to counterweights.

Sliding Doors for hangars are supplied in either Straight Slide or Round the Corner types as desired. Full details and specifications on request.



Round-the-Corner Door



Fenestra-Byrne Type B Door for Wide Opening

FENESTRA-HOLORIB STEEL ROOF DECKS AND FLOOR FORMS



Fenestra-Holorib Sheet

Fenestra-Holorib Steel Roof Plates form the permanent base of an insulated and waterproofed unit of proper design. Plates are fabricated from copper bearing or galvanized steel sheets reinforced by triangular ribs rolled into the sheet longitudinally. Plates interlock at sides and ends and are either welded to the purlins or anchored by special clips.

Twenty-four gauge sheets are rolled with ribs $\frac{3}{4}$ in. deep spaced $3\frac{1}{4}$ in. on centers and are designed for purlins spaced approximately 4 ft. 0 in. apart. Twenty-two, 20 and 18-gauge sheets are rolled with ribs $1\frac{1}{2}$ in. deep spaced not more than 6 in. on centers and will cover with unusual rigidity purlin spacings as high as 8 ft. 6 in. A dipped, oven dried, priming coat of gray paint is standard.

Insulation and Waterproofing

Holorib Roof Decks are covered with insulation of the pressure resisting type, which is mopped in place with hot asphalt over flat surfaces, and held over steep surfaces by the addition of Holorib expanding nails. One inch of insulation is preferable. Waterproofing should be of a type guaranteed by reputable manufacturers for not less than fifteen years. Tile or slate also may be used.

For Commercial and Industrial Buildings

Holorib Steel Deck is especially suitable for commercial and industrial buildings, auditoriums, etc.

Advantages

A long-lived roof with minimum maintenance; light weight reduces structural steel requirements; may be laid in any weather men can work; quick to lay—speeds construction; saves winter fuel—makes cooler interiors in warm weather; saves insurance—takes fireproof rating when used over incombustible contents; telescoping end laps made over purlins form tight interlocking joints; lower in cost than other fire resistive roofs of the same insulating efficiency.

Fenestra "Sanacoustic" Holorib Roofs

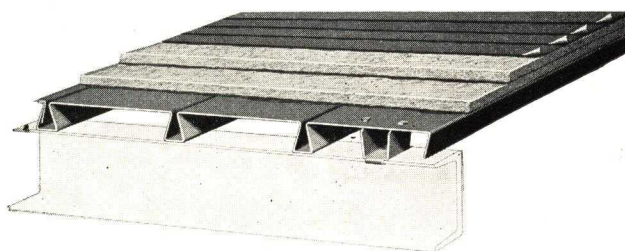
Fenestra "Sanacoustic" Holorib Roofs, applied with J-M Rock Cork, insulation and built-up waterproofing, provide acoustically treated ceilings combined with long lived roofs having a high degree of sound deadening and heat stop value at a cost far below other materials of equal efficiency.

Specifications

Specifications and full details of the product and erection service on request.

Floor Forms

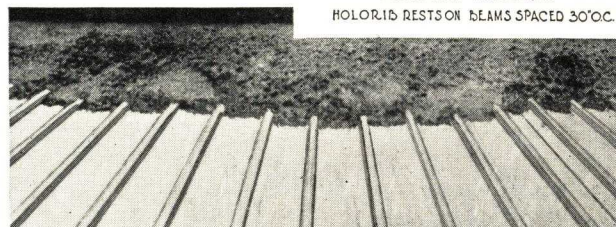
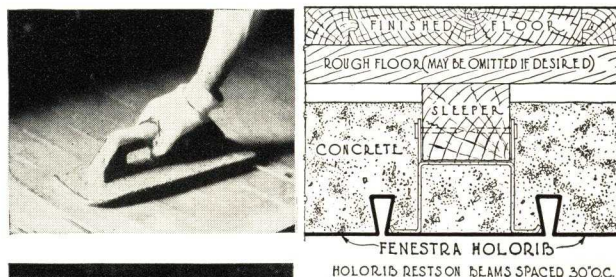
Holorib floor sheets are used both as a superior reinforcement and forms for (1) poured concrete floors where exposed structural steel framing is permitted with or without suspended ceilings, (2) balcony steps, (3) arena seats, (4) pipe ducts and trenches, (5) oven sides and roofs, etc. Sheets are furnished in one width— $16\frac{1}{4}$ in. covering capacity, but are cut to the proper lengths required—up to 10 ft. 3 in.



Fenestra-Holorib Roof Deck with Insulation and Built-up Roofing

Joists to support the Holorib usually are spaced from 36 in. to 48 in.

Holorib floor sheets are laid with the ribs up, and are anchored with special clips to the joists or structural members. These ribs key into the concrete which is poured over the forms.



Fenestra-Holorib Floor Forms

THE BARRETT COMPANY

Manufacturers of Roofing and Waterproofing Materials

NEW YORK, N. Y.

CHICAGO, ILL.

BIRMINGHAM, ALA.

THE BARRETT COMPANY, LIMITED, MONTREAL, QUE.

Products

BUILT-UP ROOFING MATERIALS

(for flat or steep roof surfaces):

BARRETT SPECIFICATION FELT and BARRETT SPECIFICATION ROOFING PITCH;

BLACK DIAMOND FELT and BLACK DIAMOND ROOFING PITCH;

S. I. S. ROOFING;

BARRETT ANCHOR ASPHALT CEMENT.

FLASHINGS (for brick and concrete masonry walls):

BARRETT FLASHING BLOCKS and FLASHING FORMS.

ROOF LEADER and VENT CONNECTIONS:

HOLT ROOF LEADER and VENT CONNECTIONS for all types of roof deck construction.

WATERPROOFING MATERIALS (for foundations, footings, reservoirs, swimming pools, subways, tunnels, floors, stadia, solid deck railroad and highway bridges, etc.):

BARRETT SPECIFICATION FELT and BARRETT SPECIFICATION WATERPROOFING PITCH;

BLACK DIAMOND FELT and BLACK DIAMOND PITCH; WATERPROOFING FABRIC.

INSULATING and BUILDING PAPERS (for sheathing, lining, flooring, etc.).

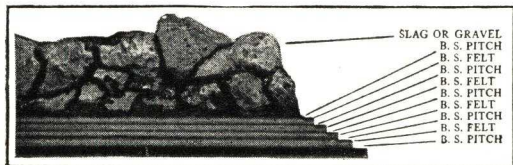
DAMP-PROOFING and PROTECTIVE PAINTS and CEMENTS.

WOOD PRESERVATIVES.

SHINGLES and PREPARED ROOFINGS.

America's Best-known Roof—the Barrett Specification

The buildings of America's greatest industries and private enterprises are protected by Barrett Specification Roofs. Examples of world-famous buildings with Barrett Specification Roofs are the Empire State, the Chrysler building, the Waldorf-Astoria Hotel, the Bank of Manhattan Building, the Woolworth, all of New York City; the Southwestern Bell Telephone Co.



Barrett Specification Roofing

Built of alternate layers of Barrett Specification Pitch and Felt (the top coat of pitch is poured) with an indestructible wearing surface of gravel or slag

Administration Building at Kansas City, Aetna Life Insurance Building, Hartford, Conn., and the S. W. Straus & Co. Building, at Chicago. Repeat business from nationally known organizations, such as Telephone Companies with 355 Barrett Specification Roofs; The American Tobacco Co. with 52; General Baking Co. with 62; International Shoe Co. with 57; Celanese Corp. of America with 31; and a host of others, testifies impressively to the value of the Barrett Specification Roof.

The reason for this marked preference for Barrett Specification construction is that engineers know that these roofs will far outlast an ordinary roof—that they are actually *built* to do so—that they are bonded by a

The *Barrett* Company
TRADE-MARK

national bonding company against repair or maintenance expense for 20 years. (The Specification Type "A" Roof is bonded for 15 years).

Twenty years is a long period of guaranteed service—about all that any owner would be inclined to ask. In the company's files, however, are thoroughly authenticated records of Barrett Roofs which have lasted 30, 40 and 50 years without requiring one cent's worth of repairs. Many of these roofs are still in good condition, giving weather-proof service.

This longevity is not surprising when one considers that coal-tar pitch is preserved by water. The life-prolonging oils in pitch are protected by the same dampness and moisture that weaken ordinary roofs. Pitch is self-healing; is virtually immune to climatic variations; possesses rot-defeating creosote properties that outlaw fermentation or the development of fungi. Both Barrett Specification Pitch and Barrett Specification Tarred Felt are manufactured to be—and are conceded to be—the best it is possible to make. Barrett Specification application methods are accepted as standard throughout the building industry.

Gravel, slag or tile provide a fire-safe, practically indestructible wearing surface which permits the use of a greater amount of waterproofing material than it is possible to use on any other types of roofs.

Barrett Specification Roofs are laid by Barrett approved roofers. Such concerns are selected on the basis of experience, ability and integrity, and are invariably leaders in their communities. They use the finest grades of materials. Their work is supervised by trained Barrett technical men during every step of the application. In every respect these roofs are built to perform far beyond the promise of any surety bond.



The Barrett Inspector Making the Famous "Cut Test"

Condensed Barrett Specification Type "AA" (4-ply) Roof —For Use Over Poured Concrete or Poured Gypsum

Incline—For inclines not exceeding one (1) inch to the foot.

Roofing—Shall be a Barrett Specification Roof, Type "AA," laid in accordance with the Barrett Specification (for use over concrete), by a roofing contractor approved by THE BARRETT COMPANY. The roofing contractor shall furnish THE BARRETT COMPANY'S Surety Bond Guaranty for twenty (20) years, in accordance with Note No. 1 of said specification.

Condensed Barrett Specification Type "A" (3-ply) Roof —For Use Over Poured Concrete or Poured Gypsum

Incline—For inclines not exceeding one (1) inch to the foot.

Roofing—Shall be a Barrett Specification Roof,

Type "A," laid in accordance with the Barrett Specification (for use over concrete), by a roofing contractor approved by THE BARRETT COMPANY. The roofing contractor shall furnish THE BARRETT COMPANY'S Surety Bond Guaranty for fifteen (15) years, in accordance with Note No. 1 of said specification.

Condensed Barrett Specification Type "AA" (5-ply) Roof—For Use Over Boards

Incline—For inclines not exceeding two (2) inches to the foot.

Roofing—Shall be a Barrett Specification Roof, Type "AA," laid in accordance with the Barrett Specification (for use over boards), by a roofing contractor approved by THE BARRETT COMPANY. The roofing contractor shall furnish THE BARRETT COMPANY'S Surety Bond Guaranty for twenty (20) years, in accordance with Note No. 1 of said specification.

Condensed Barrett Specification Type "A" (4-ply) Roof—For Use Over Boards

Incline—For inclines not exceeding two (2) inches to the foot.

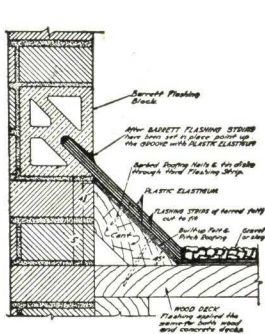
Roofing—Shall be a Barrett Specification Roof, Type "A," laid in accordance with the Barrett Specification (for use over boards), by a roofing contractor approved by THE BARRETT COMPANY. The roofing contractor shall furnish THE BARRETT COMPANY'S Surety Bond Guaranty for fifteen (15) years, in accordance with Note No. 1 of said specification.

Roofing for Steep Surfaces

Barrett built-up steep roofing specifications for sawtooth, monitor, umbrella, butterfly, hopper, plain hip, and other types of steep roof. Bonded for 10 years when applied according to Note No. 1 in Volume II of Architects' and Engineers' Reference Series.

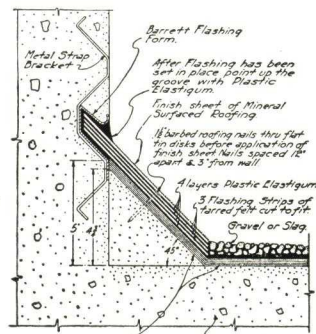
Bonded Barrett Roof Flashings

Flashings are the most sensitive parts of any roof. Realizing this, Barrett has developed a system of flashing that is absolutely dependable—that has overcome all the difficulties of flashing construction.



Cross Section of Barrett Flashing Block and Flashings

Diagram showing installation of flashing block in a brick wall



Cross Section of Barrett Flashing Form and Flashings

Metal form installed in concrete wall to form an upwardly inclined groove—a permanent cap and weather protection for flashing

This flashing system provides: (1) a durable, water-tight connection between roof and parapet; (2) a flashing that allows for expansion and contraction; (3) ease of installation; and (4) moderate cost and freedom from upkeep.

Barrett Flashings constructed with Barrett Flashing

Blocks or Forms and used in conjunction with Barrett Specification Roofs are bonded for the same period as the roof itself. Barrett Flashings constructed according to Barrett Specification, but without Flashing Forms or Blocks, are guaranteed for 10 years when used in conjunction with Barrett Specification Roofs.

Volume III of our Architects' and Engineers' Reference Series gives detailed description of Barrett roof flashing systems.

Holt Roof Connections

Holt Roof Connections, with their airtight, water-tight expansion joint, overcome all the defects of both rigid and loose-joint leader connections. They never tear away the roofing around the intake; never flood a building if the leader pipe stops up.

These connections are made for roofs of every type. They come complete—flashing flanges, expansion joint, gravel stop and attachment—everything all ready to install. There are no extras or waste time in soldering parts on the job.

Full details of all types of Holt Roof Connections are furnished in Barrett Architects' and Engineers' Reference Series. Send to THE BARRETT COMPANY for a free copy or refer to Sweet's Architectural Catalogue, Volume A.

Waterproofing

Barrett waterproofing materials conform to accepted specification requirements. Barrett Specification Waterproofing Pitch and Barrett Specification Felt—applied according to the membrane method—provide absolute protection against varying hydrostatic conditions. Waterproofing of this type, on many leading engineering and architectural projects, has established service records far in excess of other types. Specifications covering application to foundations, footings, swimming pools, floors, bridges, reservoirs, etc., appear in Barrett's Architects' and Engineers' Reference Series and in Sweet's Architectural Catalogue, Volume A. Special specifications for unusual installations furnished upon request.

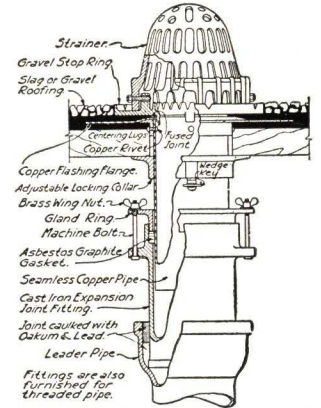
Roof Examination and Engineers' Consulting Service

For years at the request of men interested in the maintenance of large buildings, highly trained Barrett Inspectors have made careful surveys of the roofs of all these buildings and rendered detailed reports.

In many instances such examinations have resulted in large savings in building maintenance.

On request, one of our inspectors will make a careful survey of your roof, flashings, walls, coping, etc., on all your plants in conjunction with your superintendent or your master mechanic. (This service is available for big buildings, structures with roof areas of 5000 sq. ft. or more that are located east of the Rocky Mountains.)

Address Barrett Roof Examination Service, THE BARRETT COMPANY, 40 Rector St., New York, N. Y.; 2800 So. Sacramento Ave., Chicago, Ill.; or Birmingham, Ala. In Canada, write to THE BARRETT COMPANY, LTD., 5551 St. Hubert St., Montreal, Quebec, Canada.



Cross View Section of Type 1-LG Holt Roof Connection

Connection used as a leader outlet on all flat roofs having interior drainage, except roofs covered with tile, brick or similar material

THE PHILIP CAREY COMPANY

Manufacturers of Asbestos, Asphalt, Magnesia and Tar Products

GENERAL OFFICES AND FACTORY
LOCKLAND, CINCINNATI, OHIO

OTHER FACTORIES: FRANKLIN, OHIO, ST. LOUIS, MO., and PLYMOUTH MEETING, PA.

ASBESTOS MINES: EAST BROUGHTON, QUEBEC

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

For Asphalt Plank, Pipe Covering, and Asbestos-Cement Corrugated Roofing and Siding, see Manufacturers' Index

CAREY BUILT-UP ROOFING SPECIFICATIONS

Carey Built-Up Roofing Specifications comprise every type of construction, every type of surfacing—asphalt, asbestos or tar construction and asphalt, mineral, slag or gravel surfacing.

Experience and Facilities

For over half a century THE PHILIP CAREY COMPANY has supplied the public with high quality asphalt, asbestos, magnesia and allied products. Each year its facilities for manufacturing these products have been improved, consistent with modern methods and high standards. Today its ability is unexcelled.



and waterproofings are unparalleled, as Carey Branches and Distributors, located in seventy principal cities in the United States, are in a position to apply Carey Built-Up Roofings and Waterproofings quickly and efficiently.

In addition, thousands of carefully selected, authorized Carey roofers are prepared to give preferred service in the application of Carey Built-Up Roofing and Waterproofing.

Upon request we shall be glad to furnish detailed specifications covering all types of Built-Up Roof Construction, including Carey recommendations as to service adaptability of each type, complete flashing details, information relative to Wilcox Roof Drains, and other items of interest in connection with Built-Up Roofing or Waterproofing Construction.

Manufacturer's Guarantees and Surety Bonds

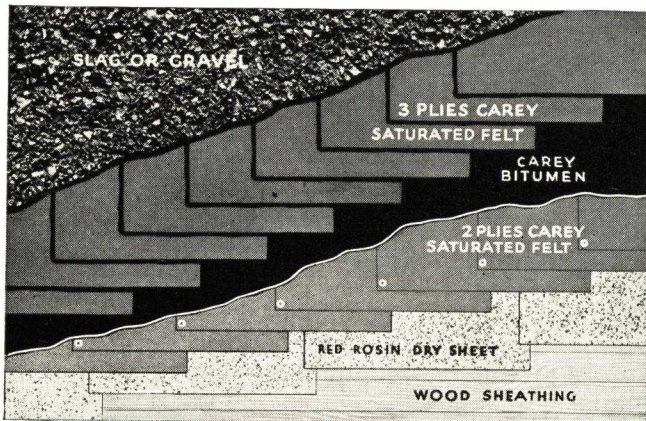
Carey Built-Up Roofs are guaranteed or bonded for periods of 10, 15, and 20 years, where inspection service is available.

Application Service

Carey organizations for applying built-up roofings

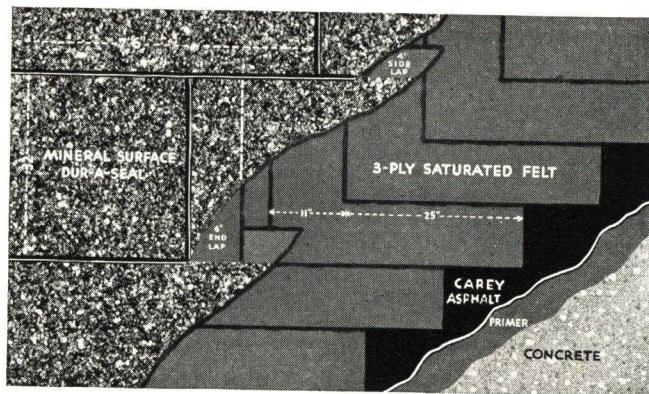
TYPICAL CAREY BUILT-UP ROOFS

Carey Master Built-Up Roofing Specification No. 1



Detail indicates construction to be followed in applying Carey 20-year Master Built-Up Roofing Specification No. 1. This specification comprises two principal types of construction—Asphalt construction, Type A, or Tar construction, Type B. Asphalt construction, Type A, is recommended for application on decks having an incline ranging from $\frac{1}{2}$ to $1\frac{1}{2}$ in. in 12 in. Tar construction, Type B, is recommended for application on decks having an incline ranging from dead level to $\frac{1}{2}$ in. in 12 in.

Carey Master Built-Up Roofing Specification No. 7



Detail indicates construction to be followed in applying Carey 20-year Master Built-Up Roofing Specification No. 7.

This specification comprises two principal types of construction—Rag felt construction, Type A, and Asbestos construction, Type C. Rag felt construction, Type A, is recommended for application on roofs where acid conditions are not prevalent, and Type C is recommended for application on roofs where acid conditions are prevalent. Deck incline: concrete, $\frac{3}{4}$ to $1\frac{1}{2}$ in. in 12 in.; wood, $\frac{3}{4}$ to 3 in. in 12 in.

KOPPERS PRODUCTS COMPANY

Coal Tar Products for Roofing, Waterproofing, Wood Preserving, Painting, Road and Street Surfacing

GENERAL OFFICES

Koppers Building, PITTSBURGH, PA.

BRANCH OFFICES

NEW YORK, N. Y., Harrison Turnpike, Kearny, N. J.
BOSTON, MASS., 250 Stuart Street
BIRMINGHAM, ALA., P. O. Box 304, Bessemer, Ala.

CHICAGO, ILL., 39th Street and 52nd Avenue, Cicero, Ill.
PROVIDENCE, R. I., 1107 Industrial Trust Building
SAN FRANCISCO, CAL., 274 Brannan Street

PLANTS

BIRMINGHAM, ALA.
KEARNY, N. J.

NEW HAVEN, CONN.
UTICA, N. Y.

CICERO (CHICAGO), ILL.
CARROLLVILLE (MILWAUKEE), WIS.

PROVIDENCE, R. I.
YOUNGSTOWN, OHIO

ST. LOUIS, MO.

Products

KOPPERS BUILT-UP ROOFING:

Koppers Old Style Pitch.
Koppers Tarred Felt.
Koppers Flashing.

KOPPERS MEMBRANE WATERPROOFING:

Koppers Waterproofing Pitch.
Koppers Tarred Felt.
Koppers Coal Tar Saturated Fabric.

KOPPERS HIGH PENETRATION WATERPROOFING:

Koppers HP Primer.
Koppers Seal Coat.
Koppers Dampproofing Paint.

KOPPERS SUB-FLOOR TARS.

KOPPERS WOOD BLOCK PITCH.

KOPPERS INDUSTRIAL AND TECHNICAL PAINTS.

KOPPERS WOOD PRESERVING OILS.

KOPPERS TARMAC for Road and Street Surfacing.



pure coal tar compound. This product complies with A.S.T.M. Specification D173-27.

Koppers Waterproofing Pitch—Koppers Waterproofing Pitch contains nothing except pure coal-tar products. The chemical stability of coal-tar-pitch under water has been proven many times.

Koppers Tarred Felt—A pure coal-tar saturated felt which is made to meet all standard specifications.

Application—Koppers Membrane Waterproofing is composed of alternate layers of Koppers Waterproofing Felt or Fabric and Koppers Waterproofing Pitch. The number of plies of fabric or tarred felt and pitch will depend upon the conditions encountered by the engineer or architect when he is preparing his design. On side walls and other head situations three to four plies of fabric or felt and four to five moppings of pitch are usually applied. Where the head of water is great as many as six plies of fabric or felt and seven moppings of pitch are employed.

Koppers High Penetration Dampproofing

This form of dampproofing is used for protecting concrete against alkali water and soils, ground water, sewerage, sea water, and other forms of chemical action which cause disintegration of concrete. It is also an effective guard against erosion of concrete caused by the flow of water at a high velocity and for waterproofing exposed surfaces of concrete where membrane waterproofing would be punctured. Two materials are required for application—Koppers High Penetration Primer and Koppers Seal Coat. We recommend that at least four coats of Koppers High Penetration Primer be applied to the concrete. Allow this to penetrate thoroughly. Then apply one coat of Koppers Seal Coat.

Koppers Dampproofing Paint

Koppers Dampproofing Paint is applied cold—no heating is required. It does not give as deep a penetration as Koppers High Penetration Waterproofing method but is used where inexpensive yet effective waterproofing is desired.

Koppers Sub-Floor Tars

Koppers Sub-Floor Tars are mixed with sand, gravel or stone, this mixture being spread over the concrete, earth, or cinder sub-base to a designated thickness over which is placed the wood flooring.

This comparatively inexpensive material makes floors resilient, damp-proof, vermin-proof and immune to dry-rot and decay.

Koppers Industrial and Technical Paints

A full line of high-grade, durable and economical paints, including:

Carbon Black Paints	Varnish Floor Paints
Black Graphite Paints	Ready-Mixed House Paints
Red Lead Paints	Flat Interior Wall Paints
Blue Lead Paints	Ready-Mixed Aluminum Paints
Tank Car Paints	Acid-Resisting Paints
Steel Freight Car Paints	Stack and Heat-Resisting Paints
Gas Holder Paints	Plastic Roof Cement or Liquid Roof
Specification Paints	Coatings (for metal or composition roofs)
Red or Brown Oxide Paints	Production Paints
Factory or Mill White Paints	Locomotive Paints
Machinery Enamels	Marine Paints and Enamels

Koppers Wood Preserving Oils

Koppers Wood Preserving Oils are highly toxic coal tar creosote oils manufactured to meet the Standard Specifications of the A.W.P.A. and A.R.E.A. Wood treated with Koppers Wood Preserving Oils is well protected from fungi, termites and other wood destroying agencies.

Tarmac

Tarmac is a refined tar for maintenance, construction and repair of private driveways, roads and streets.

Koppers Wood Block Pitch

Used as a joint-filler and cushion in the laying of creosoted wood-block flooring.

Specifications and Full Information

For detailed specifications and full information regarding any of the products listed on this page, get in touch with our nearest office.

Facts About Koppers Roofs

1. **Koppers Roofs Are Identical with the Roofs Formerly Applied Under the Names "American Tar Products Company" and "Tar Products Corporation"**—The sales division of the two companies have been consolidated under the name "KOPPERS PRODUCTS COMPANY." No changes have been made in the management or location of the plants and quick delivery from nine strategically located plants will be continued.

2. **Koppers Products Company Will Issue a Maintenance Bond on Koppers Roofing and Flashing**—These are issued for 10, 15 or 20 years covering roofs applied according to Koppers Specifications. However, the bond is optional and the identical roof may be obtained without paying the additional charge for the bond. Specify a Koppers Bonded Roof with Koppers Bonded Flashing and our inspector will be on the job to see that it is applied in accordance with our rigid specifications. The bond protects you against any maintenance cost for the period of the bond.

3. **Koppers Roofs Are Fire Resistant**—The Underwriters' Laboratories give Koppers Roofs a Class "A" rating which is the highest rating obtainable.

4. **Koppers Roofs Are Long Lived and Consequently the Cost per Year Is Low**—The heavy top pouring of Koppers Old Style Pitch (approximately 75 lbs. per 100 sq. ft. of roof) into which is imbedded slag or gravel makes a roof surface which is practically impervious to the weather. Compare this top surface with the usual smooth top roof which is finished off with a mopping of approximately 35 lbs. of bitumen. Such roofs usually require recoating within five (5) years, and the expense involved in recoating should be added to the first cost. Specify a Koppers Bonded Roof with Koppers Bonded Flashing and the first cost becomes the only cost.

5. **Koppers Roofs Are Not Affected by Continued Contact with Snow, Hail or Rain**—Snow often remains on a roof for several weeks, and rain water may not drain away for considerable time. Such treatment causes some bitumens to disintegrate, but Koppers Old Style Pitch is unaffected by prolonged contact with water. Koppers Old Style Pitch contains 100% coal tar products. The stability of pure coal tar pitch has been proven many times.

6. **Koppers Roofs Contain Coal Tar Saturated Felts**—All Koppers Roofing Felts are saturated with 100% coal tar products, which contain a high percentage of coal tar creosote oil. Such treatment insures long life as coal tar creosote is the best known commercial preservative of plant and animal fibres.

7. **Koppers Roofing Materials Are Made to Meet Rigid Specifications**—Koppers Old Style Pitch and Koppers Tarred Felts meet all standard Government, State and Municipal specifications, as well as those promulgated by the Underwriters' Laboratories, and the American Society for Testing Materials.

8. **Koppers Franchise Roofers**—The proper application of Koppers Roofing Material is of vital importance. Realizing this the KOPPERS PRODUCTS COMPANY have selected the very best roofing contractors in each vicinity to apply Koppers Roofs. Whether these Koppers Franchise Roofers apply a bonded or unbonded roof they will perform the same high quality workmanship.

Koppers Membrane Waterproofing

Koppers manufacture the following products for use in the construction of membrane waterproofing:

Koppers Waterproofing Fabric—Koppers Waterproofing Fabric is an open mesh cotton fabric, which has been thoroughly saturated with a

THE RUBEROID CO.

Roofing Manufacturers for Over Forty Years

CONTINENTAL
ROOFING MILLS

RUBEROID
MILLS

SALES DIVISIONS
ETERNIT
MILLS

SAFEPAK
MILLS

H. F. WATSON
MILLS

NEW YORK, N. Y.

CHICAGO, ILL.

OFFICES AND FACTORIES
MILLIS, MASS.

ERIE, PA.

BALTIMORE, MD.

MOBILE, ALA.

PRODUCTS

Asphalt Shingles and Roll Roofings; Asbestos-Cement Shingles and Corrugated Sheets; Asphalt and Asbestos Sidings; Asbestos, Asphalt, Coal Tar Pitch and Felt Built-up Roofs; Asbestos: Sheathings, Felts, Mill

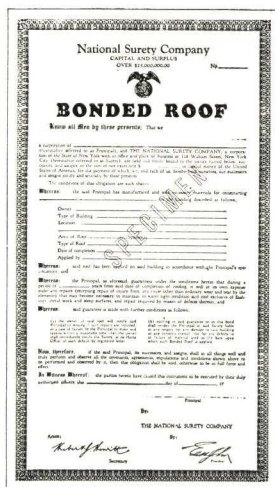
Board, Pipe Coverings; Kraft Waterproof Papers; Coal Tar and Asphalt Felts and Sheathings; Asphalt Waterproofing Paints and Cements; Dry Felts and Sheathings; Insulating and Preservative Paints; Insulating Tape.

COMPLETE LINE OF BUILDING AND MAINTENANCE PRODUCTS

Wherever industry penetrates, engineers and contractors confirm their confidence in Ruberoid Products by using them in construction and maintenance work of every type. Each Ruberoid Product is without a peer in the field. Each comes in various grades, weights and prices to fit the quality standards of the building. All Ruberoid Products are the best that can be made at their price—a policy that THE RUBEROID CO. has strictly adhered to for over 40 years.

Genuine Ruberoid Bonded Built-up Roofs

(Asbestos—Coal Tar Pitch and Felt—Asphalt)



Ruberoid offers architects and engineers a wide choice of built-up roofs that meet any condition of climate, atmosphere, unusual wear or building design. Their price range makes them attractive for any work. Their service record is proved over a long period of years.

When desired Ruberoid Built-up Roofs are guaranteed both as to workmanship and material for 10, 15 or 20 years according to the specification used. This guarantee is backed by a National Surety Bond. These guaranteed roofs are known as bonded roofs and are applied

only by approved roofing contractors. For further information, write for complete Built-up Roof Catalogue.

Ruberoid Roll Roofing Smooth and Mineralized



Ruberoid Roll Roofings are known for their long life and economy. Many roofs laid twenty and twenty-five years ago are still giving dependable service today.

Ruberoid Roll Roofing is made in two styles:

(1) **Smooth-surface**—Three weights: Heavy (55 lb.), extra-heavy (65 lb.), and super-weight (75 lb.) per 108 sq. ft.

(2) **Mineralized (heavy)**—Average approximate weight 87 lb. per 108 sq. ft. Surfaced on one side with mineral granules in three colors—green, red and blue-black. All rolls are 36 in. wide. Each roll carries the Underwriters' Class C Label. Zinc-coated nails and lap cement furnished with each roll. Extra heavy weight 110 lbs. per 100 sq. ft.



Asphalt Shingles, Rectangular Strips and Units

Ruberoid Asphalt Shingles

There is a wide choice of individual (rectangular shingles) and strips in hex, octab and square-tab designs. They come in colors, weights and thicknesses, with headlap protection, to meet varying construction requirements. The leaders are:

	Size, in.	Weight, lbs.	Pieces per 100 sq. ft.
Massive Units	12x16	312	228
Massive Hex Strips	36x13 1/4	225	76
Massive Square Tabs	36x12	245	80

Complete catalogue illustrating each shingle made with size, number of pieces per square, approximate weight, gladly furnished upon request.

Ruberoid Eternit Asbestos Shingles

Made of portland cement reinforced with asbestos rock fibres. Durable, weatherproof, fireproof and time defying. Attractive in both colors and texture.

The following styles are available in a wide range of solid or mottled colors. The mineral oxide colors are an integral part of the shingle.



Asbestos Shingles Tapered Timbertex

American Method Shingles—

Timbertex (wood textured), 8x16 in.
Gothic (rock textured), 12x16 in.

Dutch-lap Shingles—

Timbertex (wood textured), 16x16 in.

Hexagonal Shingles—

Smooth finish 16x16 in.

Also Eternit Corrugated Sidings, Stonewall, Timbertex and Brick Type Siding, particularly adaptable for industrial work.

Complete catalogue upon request.

Cement Floor Protector

When you pour concrete floors and desire to speed up construction you will appreciate the use of a labor saving curing agent, Cement Floor Protector.

This reinforced fabric allows the cement to gradually harden to proper density and strength. It also protects the floors from the seepage of water from the floor above and the drippings of cement.

It stays in place while other trades work through the building, keeping the floor clean.

Cement Waterproofing Compound

Cement Waterproofing Compound when mixed with Portland cement makes leaky cellars or pits bone dry. Its use in stucco not only waterproofs but entirely prevents "hair cracking."

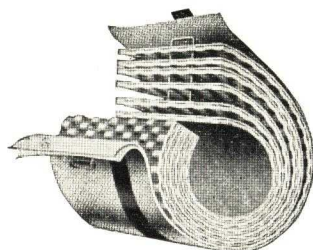
It differs from other waterproofing compounds in that it does not delay the set or reduce the strength of the mortar.

Asbestos Pipe Covering

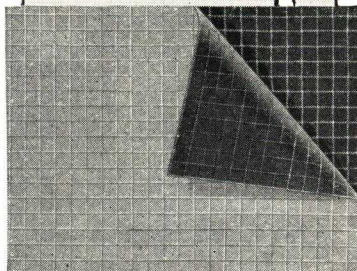
THE RUBEROID Co. also has a complete line of insulation materials including asbestos pipe covering, asbestos lagging, felt pipe covering, anti-sweat pipe covering, asbestos roll board, mill board and felting cement.

Pictured is a cross section of Imperial All-asbestos Covering for high pressure and superheated steam lines—a combination of the two most effective insulating elements, felted asbestos and "dead" air space. Will not sag on pipes. Strong, flexible, light in weight.

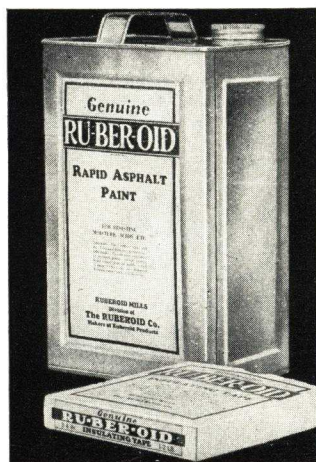
Made in sections 3 ft. long to fit all standard size pipes. Wire stitched, canvas jacketed, metal banded. Provides maximum insulation at minimum cost.



Imperial Pipe Covering
(High Pressure)



Extra Re-enforcing Cords Along Each
Edge Make It Practically
Impossible to Tear



These Insulating Products Reduce
Maintenance Costs

Building and Wrapping Papers

There is also a complete line line of building papers. Included is the well-known reinforced paper, Safe-n-dry, made of jute fabric embedded in asphalt and bound with two sheets of strong kraft paper. Safe-n-dry is used behind clapboards, stucco, shingles and brick veneer, and under floors. It has unusual strength. It is tough, flexible, yet never becomes sticky in summer or brittle in winter. Clean, odorless, waterproof and airtight. Comes in rolls of 36, 48, 60, 72 and 84 in. widths.

THE RUBEROID Co. also makes a complete line of kraft wrapping papers in various weights and prices.

Ruberoid Insulating Tape

(Formerly P. & B. Tape)

This is one of the oldest and most popular industrial tapes known—50 years of service under all conditions have proved its worth.

Ruberoid Insulating Tape is made of the highest quality and the strongest cotton sheeting, saturated with the well-known Ruberoid Insulating Compound.

In the mining field, it is extensively used for wrapping mining machines and gathering locomotive cables, and in this service it is well known for its ability to hold fast under the roughest conditions.

It is waterproof, acidproof and alkali-proof, retains its adhesiveness and insulating properties, will not dry out, vulcanize or loosen in service; provides permanent resistance against mechanical damage, reduces power losses and may be stored without risk of deterioration.

Made in 3/4 in. widths in 1/4 and 1/2 lb. rolls, and 1, 1 1/4, 1 1/2 and 2 in. widths in 1 lb. rolls. Each roll is carefully wrapped and packed in individual cartons.

Ruberoid Rapid Asphalt Paint

(Formerly P. & B. Insulation Compound)

Well known in mining fields as an efficient insulator and protector against the ravages of moisture, acids, alkalis, fumes and other corrosive agents. Its rapid drying and penetrating qualities make it exceptionally efficient for use in electric cable work.

Ruberoid Rapid Asphalt Paint forms a hard, tough coating that resists high temperatures and will not break down at 185° F. It is entirely free from coal tar.

Shipped in 60-gal. steel drums, in 30-gal. wood barrels, and in 5, 1, 1/2 and 1/4 gal. cans.

Samples and Literature

Samples and descriptive literature of any product made by THE RUBEROID Co. will be gladly sent on request. Address the nearest office.

PENNSYLVANIA WIRE GLASS COMPANY

Corrugated Wire Glass Skylights, Roofs, Canopies

EXECUTIVE OFFICE

1612 Market Street
PHILADELPHIA, PA.

FRANK L. MARTIN, President

WORKS
DUNBAR, PA.

HIRES TURNER GLASS COMPANY, DISTRIBUTORS

ALBANY, N. Y.

BALTIMORE, MD.

ROCHESTER, N. Y.

PHILADELPHIA, PA.

WASHINGTON, D. C.

Products

SKYLIGHTS and GLAZED ROOFING; MARQUESSES; GLAZED CANOPIES; SIDEWALLS; etc.

SOLID WIRE GLASS—Rough, Hammered, Ribbed, Corrugated (CWG), Figured, and ACTINIC GLASS.

Also Glass without wire netting, in various patterns and thicknesses, to suit every requirement.



TRADE-MARK

Service and Samples

We offer gratuitous engineering advice on all glass problems. With reference to our Corrugated Wire Glass service, upon receipt of rough sketches or details, we shall be glad to offer our suggestions for CWG skylights, roofs, etc.

Samples of any type of Glass we manufacture will gladly be mailed upon request.

CORRUGATED WIRE GLASS SKYLIGHTS

CWG is a corrugated sheet of glass with wire netting incorporated.

CWG is made to meet the demand for a substantial skylight, admitting properly diffused light.

CWG can be placed on a roof of any material, including corrugated iron and corrugated asbestos.

Uses—CWG can also be used on roofs, sidewalls, marquees, canopies and wherever *daylight* is desired.



Daylight Properly Admitted Through the Use of Corrugated Wire Glass in Skylights of Wagner Electric Company, St. Louis, Mo.

Weight—CWG weighs about 5½ lbs. to the sq. ft.

Strength—CWG has strength many times greater than any other glass of equal thickness, owing to the corrugations.

Kind—CWG, which is $\frac{5}{16}$ -in. thick, is made in deep angle, 2½ in. center to center of corrugations.

Standard Size—27¾ in. wide by 42 or 63 in. long, or any length up to 126 in., conditions governing.

FLAT WIRE GLASS

Process—Solid wire glass, made by the Pennsylvania continuous process, is completely formed by one pouring and one rolling.

Fire Protection—Wire glass is a valuable fire retardant—it prevents flames from attacking adjacent buildings.

Approval—Distinguishing Mark—All of our wire glass, ¼ in. and over in thickness, has the full approval

of the National Board of Fire Underwriters as a fire retardant, which requires a distinguishing mark to identify the glass. Our distinguishing mark is our *cabled strand*, appearing every 10 in. across the sheet and the full length of each sheet.

Specifications—Architects should always specify "Solid Wire Glass manufactured by the PENNSYLVANIA WIRE GLASS COMPANY" (mention the kind desired).

ACTINIC GLASS

This improved form of tinted glass will:

(1) Facilitate factory production by reducing glare and eye strain.

(2) Improve morale of workers by moderating the heat of summer sunlight.

(3) Save cost of shades.

(4) Retard fading of colors, deterioration of rubber, etc.

(5) Increase cheerfulness of interiors on dark days.

Improved ability to see, and retardation of undesirable chemical changes, such as fading of

colors, add to the general satisfaction given by this novel product.

The foregoing claims are verified by extensive practical experience. Technical details will be cheerfully furnished upon request.

The color of Actinic is technically described as an "unsaturated yellow," although it is sometimes spoken of as "light amber."

Surfaces and Thicknesses—Actinic Glass is made in rough, hammered and ribbed surfaces, in ⅛ and ¼ in. plain and in ¼ in. wire; also in the corrugated wire pattern, $\frac{5}{16}$ in. in thickness.



ESTABLISHED 1873

E. VAN NOORDEN COMPANY

Manufacturers of Vanco Skylights, Ventilators and Sheet Metal Work

TELEPHONE
Highland 3040 to 3043

100 Magazine Street
BOSTON, MASS.

Products

Manufacturers of ANCHOR BAR and DURATITE ROLLED STEEL SKYLIGHTS.

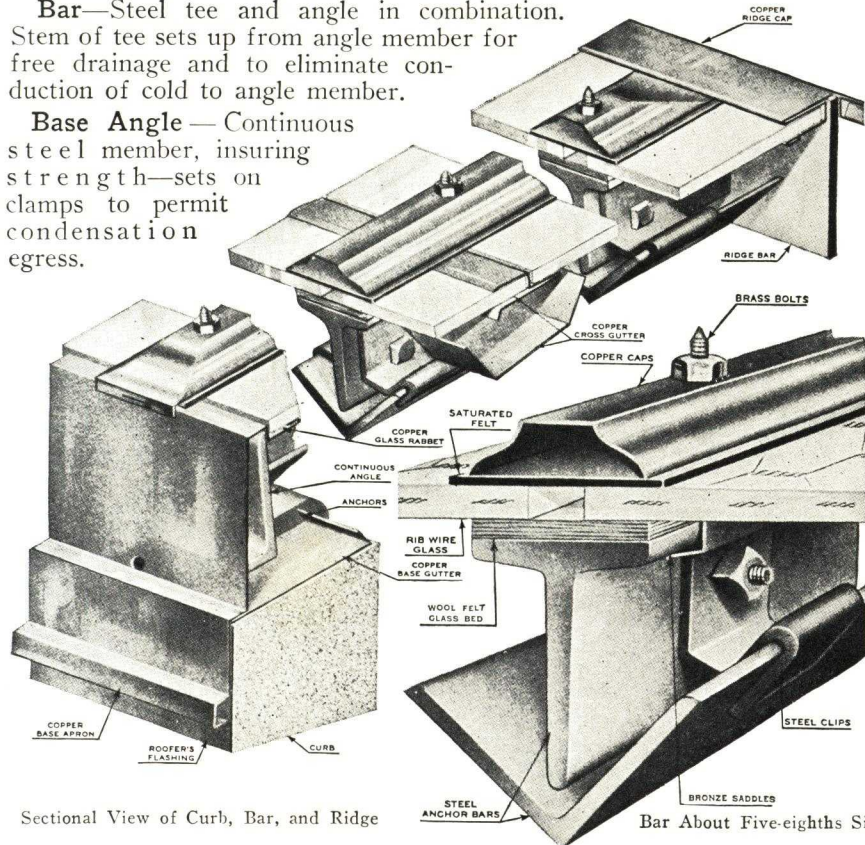
Load carrying members also in bronze and aluminum. Also manufacturers of Stationary and Revolving Ventilators, Steel Nailing Bucks, Kalamein Work, Bois Steel Stairs, Sheet Metal Work.

Note: Constructions shown on this page are thoroughly protected by United States and Canadian Patents.

Anchor Bar Skylight (Patented)

Bar—Steel tee and angle in combination. Stem of tee sets up from angle member for free drainage and to eliminate conduction of cold to angle member.

Base Angle—Continuous steel member, insuring strength—sets on clamps to permit condensation egress.



Sectional Views of Vanco Anchor Bar Skylight

Trim—Sheet metal portions of copper, leaded copper or aluminum.

Caps (Patented)—Are made with closed ends. They seal the joint at head by flashing into ridge cap. They are underlaid with a weather strip of heavy saturated felt in contact with the glass.

Vanco Saddles and Bolts (Patented)—Bronze saddles are clinched to bars at 20-in. intervals. In combination with 1/4-in. brass bolts, they draw the cap and stripping down in contact with the glass. No snapping of bolts due to expansion and contraction as the saddles permit a free movement.

Base Gutter and Apron—Collect and drain condensation and protect lower steel portions. There is a free

circulation of inside air between base angle and apron to prevent sweating.

Vanco Double Cross Gutters (Patented)—Glass is butted with double cross gutters inserted to convey condensation. The glass member is entirely segregated from gutter member to prevent conduction of cold and sweating. Lower member absolutely prevents "cross gutter drip."

Glass—Generally 1/4-in. wire glass is loose bedded on a cushion of wool felt. Since the glass rests on a structural member, the glass bed is true and uniform, which prevents the glass from lying "in wind"—a common cause of breakage. Glass generally is 24 in. wide by approximately 48 in. long.

Painting—All steel portions are coated with Vanco Compound to resist corrosion. Additional painting may be added for color finish. The bars are readily accessible for re-painting.

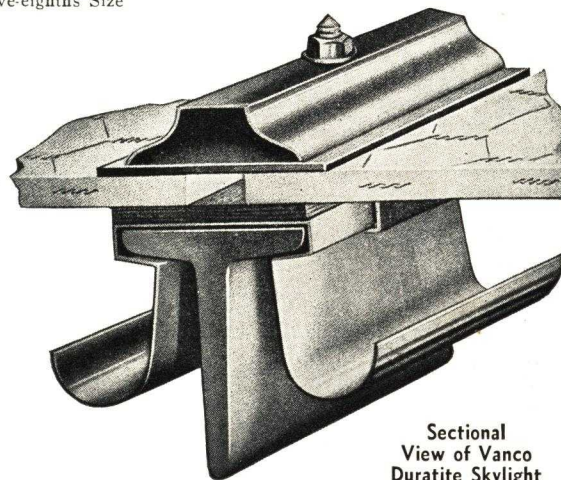
Plating—Steel portions may be treated with a range of protective media, Ship-galvanizing, Parkerizing, Ternizing (a terne coating of tin and lead) and Cadmium-plating (for aluminum skylights).

Vanco Duratite Skylight (Patented)

The construction of this skylight is similar to the Anchor Bar except that all drainage is in non-corrosive members. The bar gutter member engages the flange of tee. As the saddles are clinched over the gutter member, there is no penetration of same by the cap bolts.

Truss Bars

Anchor Bar and Duratite Skylight Bars are trussed for large spans.



Sectional View of Vanco Duratite Skylight

THE ALLEN CORPORATION

Engineers and Manufacturers of Ventilating Appliances

14th and Lafayette Streets, DETROIT, MICH.

SALES ENGINEERS IN ALL PRINCIPAL CITIES

Products and Services

ALLEN TURBINE and ALCO STATIONARY ROOF VENTILATORS, BASES and DAMPERS.

ALLEN ELECTRO-WIND TURBINE VENTILATORS.
POWER FAN AUXILIARIES.

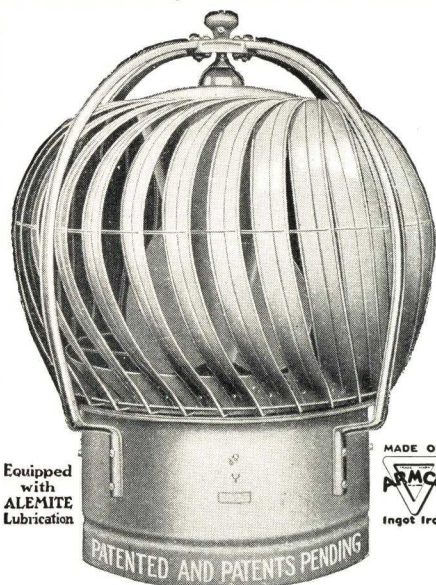
ELECTRIC EXHAUST FANS.

Allen Engineering Service is national in scope, and available without obligation to engineers.

The Allen Multi-vane Turbine Ventilator

A true rotary, air-driven, suction turbine that works automatically, continuously and silently—without maintenance or operating expense. It has many features of design and construction that make it extraordinarily efficient in all weather conditions. Because the peripheral speed of its blades exceeds the velocity of the propelling wind, it permits no air, rain or snow to enter the head, and thereby creates great suction on the lee side of all blades.

The turbine principle is supplemented by an exclusive Allen patented feature, an interior displacement cone, on which are mounted vanes properly designed to distribute the exhausted air to the low pressure areas created by the swiftly revolving blades. Bearings are of Nitralloy steel and oil impregnated bronze, grease packed. Regularly constructed of heavy "tite-cote" galvanized iron sheets. It is also constructed of cold rolled copper.



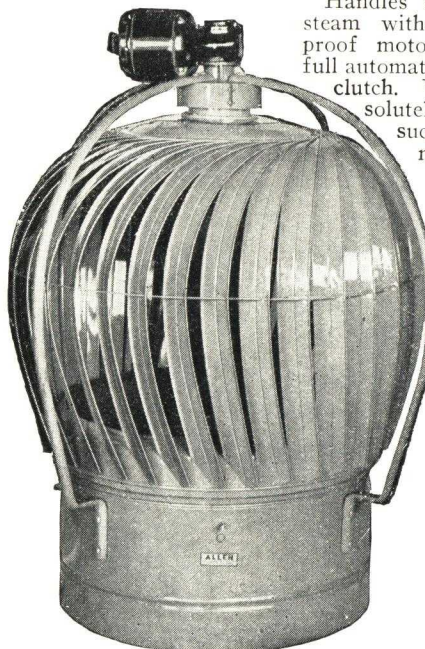
The Allen Turbine Ventilator

Allen Electro-Wind Turbine Ventilator

This dual purpose motor-driven exhauster is designed to handle unusual air-removal problems which require a large exhaust only a portion of the time or under extraordinary conditions.

Handles inflammable gases and steam without special explosion-proof motor. Specially designed, full automatic free-wheeling driving clutch. Ventilator throat is absolutely clear of obstructions,

such as fan blades, shafts, motors, etc. Uniform exhaust capacity at high speed, regardless of temperature difference, stack height, wind velocity or direction. A powerful, positive exhaust when wind driven. Motor and driving mechanism are not in path of exhaust. No penthouse required. Nobackdraft when power is off. Two speeds without variable speed motor. No power consumption at low speed. Enclosed, ball-bearing repulsion-induction, worm geared-head motor, easily accessible. Low power consumption when electrically driven.



Allen Electro-Wind Turbine Ventilator
(With motor cover removed)

For wind driven capacities see table at left

Size, in. (Throat diam.)	Extreme height, in.	Width overall, in.	Weight, lb.		Displacements, cu. ft. per hr. T1-T2 = 20° Vent. height = 10 ft.	
			Vents	Crated	Wind vel. = 4 m.p.h.	Wind vel. = 8 m.p.h.
8	24	16	13.5	19.5	17,300	21,600
10	25	18	16.5	25.5	26,500	32,500
12	27	20	24.3	36.5	38,600	46,200
15	33	24	31.5	49.	54,000	69,000
18	35	28	45.	82.5	85,200	102,100
20	37	31	54.5	99.5	105,100	125,600
24	45	37	96.5	157.5	149,000	185,000
30	52	46	122.	226.	225,000	272,000
36	55	48	150.	270.	281,000	330,000
42	59	58	232.	453.5	324,000	414,000
48	63	66	267.	537.5	360,000	473,000

Diam. of turbine, in.	Motor*		Rotor Speed R.p.m.	Air displacement		Weight, lbs.	Shipping weight, lbs.
	R.p.m.	Hp.		Cu. ft. per min.	Cu. ft. per hr.		
24	1725	1/4	173	5,400	324,000	157	264
30	1725	1/4	173	8,125	487,500	183	350
36	1725	1/4	173	10,200	612,000	215	400
42	1725	1/2	144	11,700	702,000	300	585
48	1725	1/2	144	13,000	781,000	335	670

*Unless otherwise specified, single-phase, 60 cycle, repulsion-induction, enclosed ball-bearing motor will be furnished.
Data on smaller sized ventilators furnished on request.
Thermostatic control information may be had by writing home office.

The New Alco Stationary Ventilator

This Allen quality ventilator is obtainable at low cost and is exceptionally efficient when conditions do not warrant the installation of the above mentioned types.

It exhausts more air per minute than other stationary or swivel type ventilators of same size that we know of.

Installation costs are less because fewer units and smaller bases are used.

Heavy gauge metal and made of galvanized Armco Ingot-Iron and painted with two coats of brilliant aluminum rust-resisting paint.



The Alco
An Allen Quality
Stationary Ventilator

SPECIFICATIONS OF ALCO STATIONARY VENTILATOR

Size, in.	Height, in.	Width, in.	Gauge of galv. iron	Copper, oz.	Weight uncrated, lbs.
8	11	14	24	18	7
12	16	22	24	18	14
16	20	28	24	18	30
20	26	36	22	20	44
24	30	44	22	20	67
30	36	52	20	20	91
36	40	60	20	20	131
42	44	72	18	24	197
48	50	80	18	24	234

ESTABLISHED 1890

THE BURT MANUFACTURING CO.

Manufacturers of Roof Ventilators, Oil Filters and Exhaust Heads

601 Main Street, AKRON, OHIO

BRANCH OFFICES IN ALL PRINCIPAL CITIES

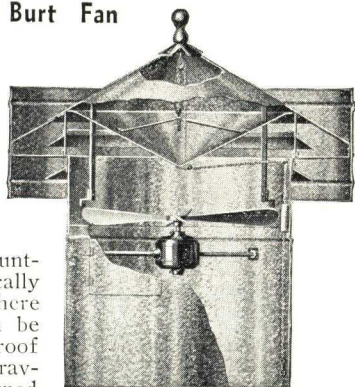
Roof Ventilators

Thirty years' experience in ventilating all kinds of buildings, including factories, foundries, schools, hotels, public buildings and homes, has formed the groundwork for the development of the following roof ventilators by the engineers of THE BURT MANUFACTURING CO.

Burt Ventilators are made in standard sizes from 10 to 72 in. Details on Rectangular, Weave Shed and other types furnished on request. Prime rust-resisting open hearth galvanized steel used in standard construction but can be made from any material specified, including copper, zinc, lead clad sheets, toncan metal, ingot iron, Keystone Copper Bearing Steel, aluminum or Monel Metal. All Burt Ventilators are guaranteed against defects in material and workmanship throughout their life.

New Direct Connected Burt Fan Ventilator

This new drive eliminates all belts, idlers and pulleys and can be furnished in any electrical characteristics that you have available. Motor fully enclosed and protected against damaging action of fumes and vapors. Composition motor mounting makes operation practically noiseless. Positive in action where conditions are severe. Can be furnished with explosive-proof motors. Operates as the best gravity type when motor is turned off. Sizes 14 to 60 in. inclusive.

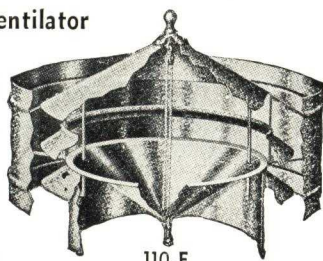


100-E

Burt Cone Damper Ventilator

In this ventilator we have incorporated all the best ideas that our 30 years' experience in this field has furnished us.

It is storm-proof—has no moving parts, fire resisting and no down draft. Scientifically designed in accordance with the findings of the Bur. of Standards and the A. S. H. & V. E. Made of galvanized stock throughout. Designed so damper action is positive and is locked at ventilator—no tied operating chain. Guaranteed exhaustive capacity—test with any competing make.

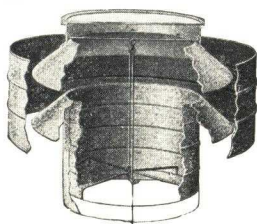


110-E

Burt Sliding Sleeve Damper Ventilators

Cut shows our Glass Top Sliding Sleeve Damper Ventilator. Can be equipped with a metal top if the skylight feature is not needed or desired.

Being equipped with a sliding sleeve damper and clip, air shafting is never obstructed, hence maximum light and air can enter the building regardless of the position of damper.



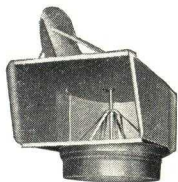
105-E

Burt Ball Bearing Revolving Vents

A late Burt development—neat, well constructed and highly effective.

Equipped with two sets of high grade Ball or Timken roller bearings and is positively guaranteed not to stick or bind.

Its design and open back construction cause the air currents to pass not only over the top and sides of the ventilator but also allow them to pass directly through same. This, together with the partial vacuum on the lee side of the ventilator caused by the large hood construction, greatly increases the pulling power and holds it steady with the wind. It also prevents any constant whirling motion which is a faulty feature with most revolving types.



115-E

Burt Oil Filtering System

In the Burt system the waste lubricating oil used in lubricating machinery often amounting to from 50 to 90% of the total used is gathered, and passed through the filter, purified and pumped to the reservoir if one is required. This process, constantly repeated, is automatic and requires little attention. The system can be installed very easily by any engineer.

We are prepared to furnish a system complete, including filters, reservoirs and pumps. They can be operated either as batch filters or continuous by-pass systems, or in connection with specific installations. Made for all services, including industrials, sugar mills, paper mills, rubber mills, rolling mills, mines, etc.

New Burt Universal Unit Filter

The latest addition to the line of Burt Filters is the Universal Unit Filter which was developed for superservice stations where it is used to clean crankage oil for use in oil burning equipment. However, it produces excellent results on practically any grade of oil. It has a high capacity for its size, filtering from 250 to 500 gals. per day and occupying only 4 sq. ft.

Cross Oil Filters

Recommended for filtering engine and common machinery oils.

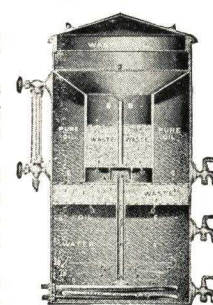
This filter is equipped with steam coils for thinning the oil, thereby facilitating filtration. If kept in a warm place coils need not be used.

Ordinarily, cleaning is necessary about once every three or four months. This is very easily accomplished without interfering with the pure oil supply and can be done at a few cents expense per year.

Any type of Burt Filter can be used as dry filter, the water being eliminated. This is necessary for some work such as transformer and central station service.

Its filtering medium is high-grade white waste, filter cloths, perforated screens and water. Capillary attraction being necessary before the oil passes into the pure oil reservoir, absolutely insures a clean product.

Information on Cross Filters, Style A for large systems and Style B with water separating device, furnished on request.



200-E

Burt Unit Type Oil Filter

The Unit type provides a filter of any capacity desired, at the same time occupying a comparatively small space. Each unit can be used in connection with or independent of an oiling system.

This type can grow with your plant as units can be added when necessary. As units are added they are connected together and operated as one unit.

Filters can be furnished in any capacity specified.



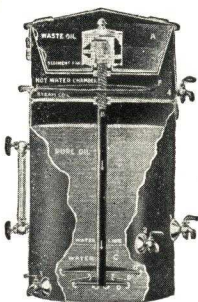
201-E

American Oil Filter

This filter is similar in construction to the Unit type with the exception that it is round in shape and has only one filter chamber.

It is intended for use in connection with gas and gasoline engines and is especially recommended for cleaning lard, cylinder and crank case as well as other grades of heavy oil.

Information on specially built filters for engines of any kind sent on request.



202-E

Exhaust Heads

We manufacture a Burt and a Standard Exhaust Head.

The Burt Head is constructed with perpendicular sides. This increases the inside area, thereby providing plenty of room for expansion of the steam without back pressure.

It has only one steam chamber—the entire head—with no baffle plates, no diaphragm, no scrap metal.

The Standard Exhaust Head is built for those who prefer to use centrifugal force for separating water and oil from exhaust steam.

H. H. ROBERTSON COMPANY

Gravity and Fan Ventilators; Puttyless Skylights and Sidewall Sash

PITTSBURGH, PA.

FACTORIES: AMBRIDGE, PA.; SARNIA, ONT., CANADA; ELLESMERE PORT, CHESHIRE, ENG.

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 ATLANTA, GA., J. M. Van Harlingen, 609 Forsyth Bldg.
 BALTIMORE, MD., H. H. Robertson Company, 2602 Baltimore Trust Bldg.
 BIRMINGHAM, ALA., H. H. Robertson Company, 606 Protective Life Bldg.
 BOSTON, MASS., Northeastern Metal Company, 307 Dorchester Ave.
 (So. Boston)
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 BUTTE, MONT., Archie W. Adams, 618 Metals Bank Bldg.
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 TULSA, OKLA., Murray R. Womble, Thompson Bldg.
 WASHINGTON, D. C., H. H. Robertson Company, 230 Rhode Island Ave., N.E.

For England: H. H. ROBERTSON CO., MERSEY IRON WORKS, Ellesmere Port, Cheshire

FOR CANADA: H. H. ROBERTSON CO., LTD.

TORONTO (MAIN OFFICE), 506 Metropolitan Bldg.

MONTREAL OFFICE, 524 Confederation Bldg.

Products

ROBERTSON GRAVITY VENTILATORS; ROBERTSON FAN VENTILATORS; ROBERTSON RECTANGULAR VENTILATORS (Gravity and Fan); ROBERTSON VENTILATOR BASES; HOODS and DUCTS; LOUVRES.

ROBERTSON PUTTYLESS SKYLIGHTS, SIDEWALL SASH, MONITOR SASH and SPECIAL SASH.

Also Robertson Protective Asphaltic Coatings and Special Bituminous Compounds.



TRADE-MARK

For Robertson Protected Metal (RPM) corrugated roofing, siding, building trim and steel decks, and Hard Finish Robertson Protected Metal, see Manufacturers' Index.

Patents—Robertson Ventilators are protected by United States Patent No. 1,589,581, June 22, 1926; Canadian Patent No. 244,617; other patents pending; also covered by patents in other countries.

Robertson Skylights and Sash are protected by United States Patents No. 1,243,020, October 16, 1917, and No. 1,666,764, April 17, 1928; also covered by other patents in United States and other countries; other patents pending.

ROBERTSON ROOF VENTILATORS

The Robertson Ventilator

Robertson Ventilator is a stationary type of great capacity. Its height makes it possible to have free area outlets almost three and one-quarter times the stack area. This permits unobstructed passage of air. The ventilator is enclosed in a suction band which increases the area, displaces more air and causes a great vacuum action from passing winds. Because of the area of the free air outlets and the suction band action, it is usually possible to obtain ample ventilation with a smaller number of Robertson Ventilators than with other types with a more standard rate of discharge. *This fact should be borne in mind when figuring costs on Robertson Ventilation installations.*

Importance of Ordering by Exhaust Capacities—Ventilators are sold by sizes expressed in inches. These sizes refer to width of stack opening and not to over-all width of ventilator. However, over-all width has a direct bearing on exhaust capacities because it affects air displacement. Two ventilators of the same rated size may be greatly different in actual size.

The safe way to order ventilators is by exhaust capacities.

Capacities of Robertson Ventilators (in actual field service) have been determined under 2250 sets of conditions. These figures are published in a data book which will be sent on request. Capacities of various sizes under one set of conditions are given at right.

Construction Details—Robertson Ventilators are made of Robertson Protected Metal (RPM) galvanized steel, copper, aluminum or any other suitable material. RPM is used in severely corrosive conditions. The parts are joined into a strong, rigid unit with system of bracings with

bolts and lock washers. The ventilator withstands wind pressures equal to dead load of 30 lbs. per sq. ft.

Explosion Cap—For grain elevators and factories where dust explosions may occur, Robertson Ventilators may be equipped with explosion caps. They are hinged on both sides and open in the middle to make the full area of stack available. They withstand suction of 75 m.p.h. wind velocity without opening, but will open with explosion pressure inside of 4 lbs. per sq. ft.

TYPICAL ROBERTSON VENTILATOR CAPACITIES

Wind velocity: 8 m.p.h. Difference in temperature inside and outside: 20° F. Height of ventilators above air intakes: 50 ft.

Size, in.	Discharge cap., per min., cu. ft.*	Size, in.	Discharge cap., per min., cu. ft.*	Size, in.	Discharge cap., per min., cu. ft.*	Size, in.	Discharge cap., per min., cu. ft.*
12	462	20	1499	42	5658	66	13872
14	665	24	1848	48	7398	72	16646
16	898	30	2882	54	9341	84	22472
18	1041	36	4160	60	11560	96	29358

*These figures represent actual measured exhaust capacities and not so-called "rated capacities."

DIMENSIONS, GAUGES AND WEIGHTS OF ROBERTSON VENTILATORS

Letters here refer to accompanying diagram

Dimensions, in.				Gauge* galv. and RPM	App. net wt., lbs.		App. shpg. wt., lbs.	
A	B	C	C'		Galv.	RPM	Galv.	RPM
12	22 $\frac{3}{4}$	22 $\frac{3}{4}$	24	24	31	46	64	81
14	27 $\frac{1}{2}$	26 $\frac{1}{2}$	28	24	40	59	77	99
16	29 $\frac{1}{4}$	30 $\frac{1}{8}$	32	24	48	70	96	125
18	32 $\frac{1}{2}$	34	36	24	57	87	138	172
20	38 $\frac{1}{2}$	37 $\frac{1}{2}$	40	24	71	103	166	209
24	45	45 $\frac{1}{2}$	48	22-24	110	160	299	357
30	55 $\frac{1}{2}$	57	60	20-22	191	247	443	529
36	67 $\frac{1}{2}$	67 $\frac{1}{2}$	72	20-22	275	358	545	647
**42	74 $\frac{1}{2}$	79 $\frac{1}{2}$	84	18-20	528	584	786	933
**48	89 $\frac{1}{2}$	91	96	18-20	635	782	1026	1219
**54	101 $\frac{1}{2}$	102	108	18-20	796	969	1219	1465
**60	108 $\frac{1}{2}$	113	120	18-20	1127	1395	1697	2052
**66	126 $\frac{1}{2}$	125	132	18-20	1360	1645	2182	2589
**72	129	136	144	18-20	1680	1995	2476	2932
**84	149 $\frac{1}{2}$	158 $\frac{1}{2}$	168	16-20	2314	2805	3146	3784
96	185 $\frac{1}{2}$	181 $\frac{1}{2}$	192	16-20	3890	4426	4568	5426

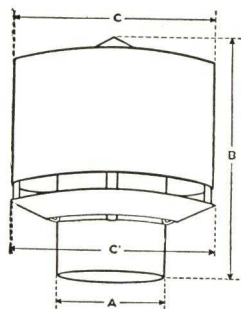


Fig. 2

Letters on diagram refer to accompanying table

*Where two gauges are shown, heavier gauge is for stack only.
 **Indicates that ventilator is shipped partially knocked down.

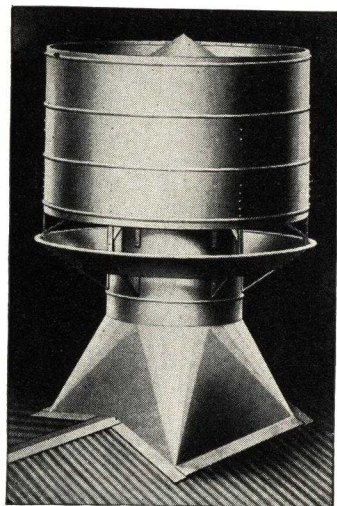
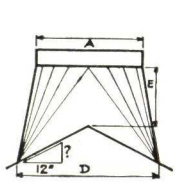


Fig. 1. Robertson Ventilator

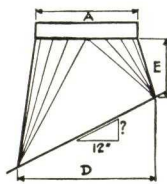
ROBERTSON VENTILATOR BASES

Can be furnished for any kind of roof. The types diagrammed below are commonly used. Round to square bases are strongest and are shipped unless otherwise ordered.



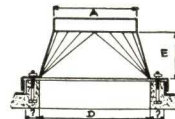
Type No. 1

To fit ridge of roof



Type No. 3

To fit slope of roof



Type No. 6

To fit over curb

Types 1 and 3 fit roofs of any slope. In ordering specify roof slope, type of base and kind of roof deck.

Type 6 fits concrete or wood curbs. Specify opening size and curb thickness.

DIMENSIONS, GAUGES AND WEIGHTS OF VENTILATOR BASES

Dimensions, in. Letters refer to diagrams			Gauges, RPM and galv.	App. net wt., lb.		App. shpg. wt., lb.	
Size A	Size D	Size E		Galv.	RPM	Galv.	RPM
12	16x 16	10	22	12	16	56	64
14	18x 18	10	22	18	23	63	73
16	21x 21	10	22	25	30	66	77
18	24x 24	10	22	35	40	79	90
20	28x 28	10	22	45	55	98	111
24	32x 32	10	22	55	75	106	120
30	38x 38	12	20	75	100	143	162
36	45x 45	14	20	110	140	173	200
*42	52x 52	**14	18	140	180	273	299
*48	60x 60	**15	18	190	230	432	495
*54	68x 68	**16	18	240	300	542	618
*60	78x 78	**20	18	300	380	539	627
*66	87x 87	**22	18	360	480	638	740
*72	96x 96	**24	18	460	580	841	968
*84	110x110	**26	16	660	770	1090	1221
*90	118x118	**28	16	785	920	1329	1485
*96	126x126	**30	16	935	1085	1514	1689

*Ventilator base in two pieces. **Dimension E for Type No. 6 bases, 42 in. and larger, is one-half of Dimension A.

ROBERTSON RECTANGULAR VENTILATORS

Robertson Ventilators are offered in rectangular shapes for buildings where straight lines are desirable to harmonize with the architectural lines, and in buildings where large ventilating openings are required for rapid removal of fumes and heat.

The rectangular ventilator provides a continuous ventilating opening throughout its entire length.

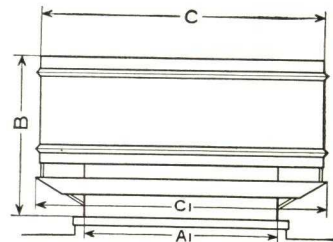


Fig. 3

Letters on diagram refer to accompanying table

It can be made in any desirable length.

It has all the advantages of the round ventilators.

Auxiliary power attachments (as described under Robertson Fan Ventilators) can also be installed in the rectangular ventilator.

If such an installation is desired, write H. H. ROBERTSON COMPANY for recommendations.

DIMENSIONS, WEIGHTS, CAPACITIES OF ROBERTSON RECTANGULAR VENTILATORS

Dimensions, in. Letters refer to diagrams				Gauge, galv. and RPM	App. net wt., lb.		App. shpg. wt., lb.		Size of Robertson round ventilator with same exhaust cap., in.
Size A1	B	C	C1		Galv.	RPM	Galv.	RPM	
8x 16	15 ⁵ / ₁₆	22 ³ / ₄	24	24	33	45	86	99	12
10x 20	20	29 ¹ / ₄	30	24	52	73	118	138	16
12x 24	23 ¹ / ₄	34 ³ / ₈	36	24	109	138	195	224	18
18x 36	34 ¹ / ₂	51 ¹ / ₈	54	24	186	244	352	410	24
24x 48	46	68 ³ / ₈	72	24	399	508	672	781	36
30x 60*	63 ⁵ / ₁₆	86 ³ / ₄	90	24	555	708	1034	1186	42
36x 72*	74 ¹ / ₄	104	108	24	646	853	1165	1372	54
42x 84*	80 ⁷ / ₈	121 ³ / ₈	126	22	838	1104	1558	1830	66
48x 96*	91 ¹ / ₈	138 ³ / ₄	144	22	992	1347	1885	2235	72
54x108*	98 ¹ / ₂	156	162	22	1380	1807	2291	2720	84
60x120*	119 ³ / ₈	173 ¹ / ₂	180	22	1626	2150	2666	3190	90
66x132*	121 ³ / ₈	190 ³ / ₄	198	22	2412	2948	3515	4045	96

*Shipped partially knocked down.

ROBERTSON FAN VENTILATORS

The standard Robertson Ventilator has long been known as one of the most efficient gravity-type ventilators on the market. To obtain greater flexibility for this ventilator under unfavorable atmospheric conditions and more positive ventilation at certain periods, an auxiliary power attachment has been incorporated in it. This is the Robertson Fan Ventilator.

Because of the scientific design of the free area outlets in the standard Robertson Ventilator, the auxiliary power attachment is able to set a new maximum for the number of cubic feet of air moved per minute per horsepower.

The power attachment is made in a separate unit and can be attached to any Robertson Ventilator, including those now installed. It can also be installed in the Robertson Rectangular Ventilator.

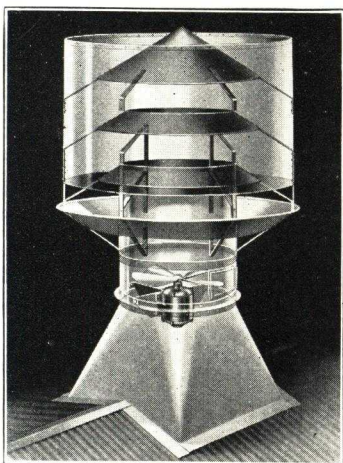


Fig. 4. Robertson Ventilator with Fan in Stack

TYPICAL CAPACITIES OF ROBERTSON FAN VENTILATORS

Wind velocity: 6 m.p.h. Difference in temperature inside and outside: 30°. Stack action: 50 ft.

Vent diam., in.	Fan diam., in.	Number of fan blades	Motor h.p. consumed	Total exhaust of fan and vent., cfm.	Shipping weight of fan, lb. (Fan, motor, mounting and collar)
12	8	4	1/20	640	80
14	10	4	1/40	875	95
16	12	4	1/40	1195	112
18	14	4	1/30	1650	140
20	16	4	1/20	2140	155
24	18	4	1/12	2880	175
30	24	4	1/10	4675	228
36	30	4	1/4	8040	270
42	30	4	1/4	9190	365
48	36	4	3/4	13880	415
54	42	6	1	18265	545
60	48	6	2	26175	795
66	54	6	2	29900	945
72	54	6	2	31550	1105
84	60	6	3	43535	1327

Table is for fans in ventilators where there is no duct in connection with installation. For static pressure data, write for Robertson Ventilator Data Book.

Motor Inside or Outside—For ordinary conditions, motor and fan are installed in the stack, as in Fig. 4. For severely corrosive conditions, the motor is installed on top of the ventilator cap as in Fig. 5. Automatic control, providing cut-in and cut-out of motor, furnished at extra charge.

Damper Controls—Flat, butterfly or louver dampers can be furnished in the ventilator stack. Damper control is either (a) *hand control*, by a simple chain or gear-operated shaft connected to rack and pinion and operated by hand wheel; or (b) *electric control*, by push button or thermostat.

Low Static Pressure—Static pressure loss due to velocity in Robertson Ventilators does not exceed $\frac{1}{8}$ in. w.g. at a velocity of 1850 l.f.m. with air temperature 70° F. and barometric pressure 29.92 in. of mercury (sea level).

Lubricating Devices—Lubrication of motor and fan bearings by hand, from a convenient point near the floor of the building, for a single unit; or a centralized lubricating system for a series of units, can be furnished at an extra cost.

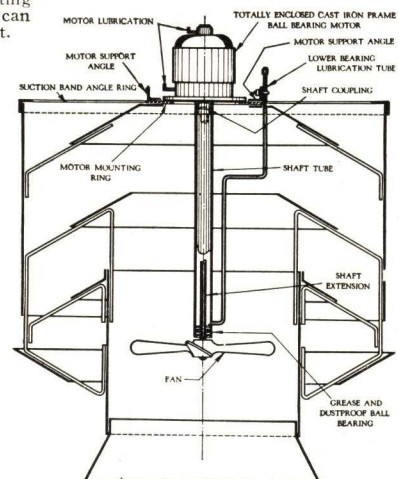


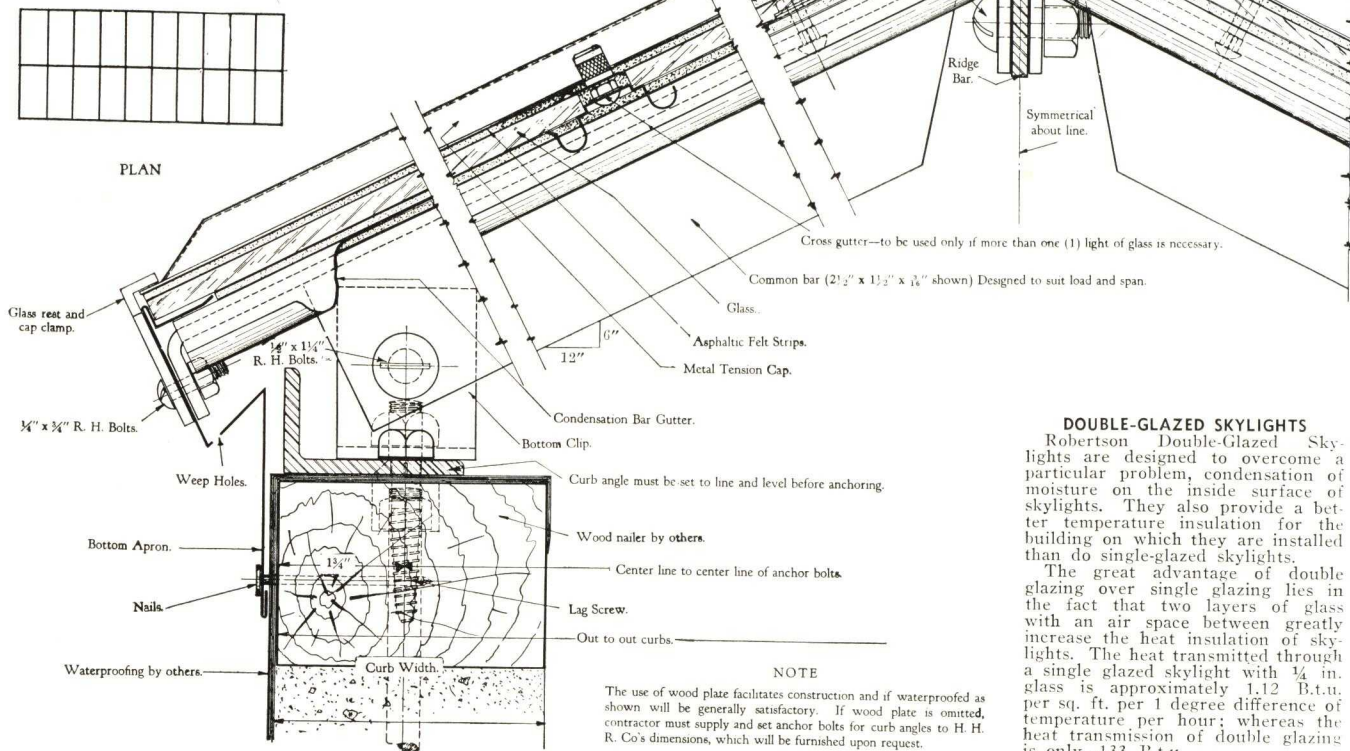
Fig. 5. Robertson Ventilator with Motor on Top of Cap

ROBERTSON SKYLIGHTS (PUTTYLESS TYPE)

The Robertson Skylight was originally designed with the idea of building the finest possible type of skylight without regard to price. This was done. New production methods and standardization have now brought its price down to the general level in the skylight field. Its quality remains the same.

It has these factors of superiority:

(1) The Robertson Skylight is as strong as any other part of the building. Load-carrying members are



DOUBLE-GLAZED SKYLIGHTS

Robertson Double-Glazed Skylights are designed to overcome a particular problem, condensation of moisture on the inside surface of skylights. They also provide a better temperature insulation for the building on which they are installed than do single-glazed skylights.

The great advantage of double glazing over single glazing lies in the fact that two layers of glass with an air space between greatly increase the heat insulation of skylights. The heat transmitted through a single glazed skylight with 3/4 in. glass is approximately .112 B.t.u. per sq. ft. per 1 degree difference of temperature per hour; whereas the heat transmission of double glazing is only .133 B.t.u.

structural steel bars, suited to the load and span, with minimum thickness of 3/8 in. Deflection is never greater than 1/30 in. per lin. ft. of bar length, under 40-lb. load, with safety factor of 4. Spans up to 20 ft. wide without supporting trusses and without excess deflection. Any architect can check the strength with standard deflection formulas for steel structural members.

(2) Load-carrying bar and condensation gutter are different units and are separated from each other with asphalt felt cushions. Corrosion in condensation gutter cannot weaken the load-carrying bar.

(3) The weaknesses of both the putty type and the puttyless type are eliminated. There is no putty to decay or fall out; yet the glass is not laid against metal. Asphaltic felt cushions are used between all glass and metal members. The Robertson principle is to keep water completely out, rather than to let it in and drain it off with gutters.

Types of Robertson Skylights—Single Pitch; Depressed Head (with top of skylight inserted under roofing and bottom raised above roofing to provide perfect watershed); Double Pitch (with glass or metal gable ends); Hip Type; Turret Type (with operating sash in sides and fixed sash in ends); Hatch Type; Top-hung Continuous Monitor and Sawtooth Sash. Any of these types can be furnished in Double-Glazed Construction.

Materials—Trim can be galvanized steel, aluminum, copper. Glass is 3/4-in. rough or ribbed wire glass. Special types of glass can be furnished. All glass butt-jointed.

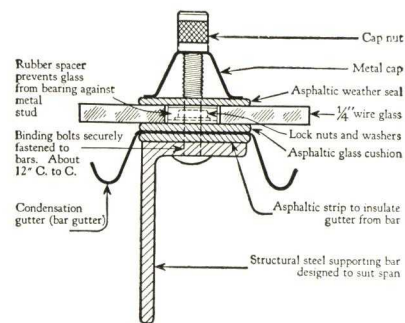


Fig. 6. Cross-sectional View Showing Details of Robertson Glazing Construction

ROBERTSON SIDEWALL SASH (PUTTYLESS TYPE)

The Robertson Sidewall Sash is totally different in principle from the usual sash. Very large panes of glass are used (up to 6 ft. high and 2 ft. wide); all small intermediate glass-supporting bars are eliminated; the entire weight of steel is concentrated in the load-carrying bars. This makes it possible to use structural steel bars as the load-carrying members without adding to the weight of the sash. The sash is therefore designed and fabricated like the steel framework of the building. It does not sag; there is no network of small steel bars to rust out. *No load-carrying member has ever had to be replaced in any Robertson Sash.*

No putty is used. The glass is laid in permanent asphaltic felt cushions. The glass is 3/4-in. wire glass instead of 1/8-in. window glass. Maintenance is at a minimum.

Trim can be furnished in a choice of materials where corrosive conditions are bad.

Sash can be furnished to fit sidewall openings of any proportions. Also furnished in double-glazed construction.

Operating Devices—If operators are desired for sash, tension or torsion types, with chain, hand wheel, pole or electric drives, can be furnished.

The Robertson Sheetlite

The Sheetlite is a glass window set into a standard corrugated sheet of RPM (Robertson Protected Metal) which can be inserted as a unit in any spot of the roof or walls of a building. It is 33 inches wide and in even foot lengths from 5 to 12 ft. Also in operating types.

THE SWARTWOUT COMPANY

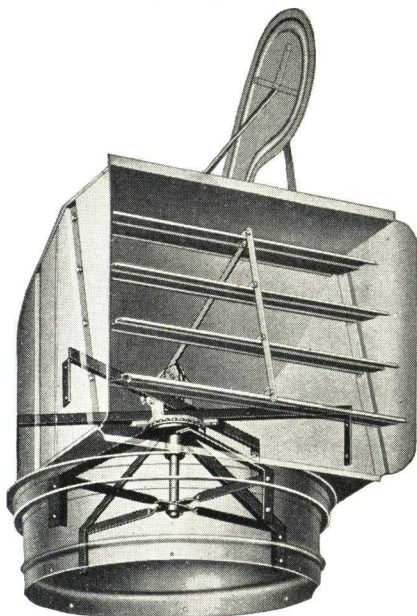
Swartwout Rotary Ball Bearing Ventilators

18545 Euclid Avenue, CLEVELAND, OHIO

Products

SWARTWOUT ROTARY BALL BEARING VENTILATORS, VENTILATOR BASES and AIR INTAKES.

For Swartwout Power Plant Equipment, see Manufacturers' Index.



Note: Swartwout now offers a new ventilator designed for use where highly corrosive forces are present—the Swartwout Vitreous Enamelled Ventilator.

Construction

Two different types of Swartwout Rotary Ball Bearing Ventilators are now available in all standard sizes. One model, suitable for nearly all ventilation purposes, is constructed of Armco ingot iron. All joints are double seamed and all interior members covered with special rust-resisting coating after forming and punching. The second and newer model is the Swartwout Vitreous Enamelled Ventilator, built especially for use where strong, corrosive gas, fumes and steam must be handled. This also has an Armco structure, to which the enamel is fused.

Bronze bearings, revolving on bronze balls, provide free rotation of all Swartwout Ventilators. No lubrication necessary. Outside louver dampers are controlled easily from within the building by a special ratchet attachment which permits definite setting of area opening without necessity of fastening chain. Bases to fit standard sizes are made of Armco iron, two gauges heavier than that in the ventilator.

Erection and Operation

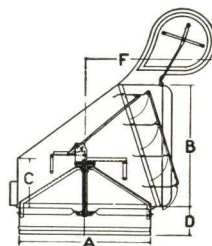
Shipped to the purchaser completely assembled, ready for the roof. Easily handled; quickly and economically installed.

Rotating with the wind movement, Swartwout ventilators provide a continual suction of air from within the building. Foul air is exhausted, while the suction pulls clean air in through lower windows or intakes.

Survey Service

Maintaining a staff of ventilation experts for the purpose, THE SWARTWOUT COMPANY will make a thorough study of the need for ventilation in your plants or buildings. There is no charge for this service. However, if you choose to follow the recommendations of a Swartwout Survey, you are assured of guaranteed ventilation.

Write for a copy of "The Gospel of Fresh Air," a booklet describing Swartwout Ventilators and service.



DIMENSIONS, WEIGHTS AND GAUGES OF SWARTWOUT VENTILATORS

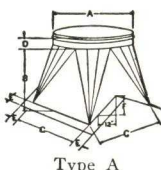
For dimensions, "A," "B," "C," "D," "F," in inches see table below. In ordering, only dimension "A" is required.

INSTALLATION

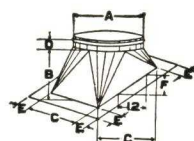
To insure proper installation and immediate satisfaction, complete directions for mounting are supplied on each ventilator.

A	B	C	D	F	Gauge iron	Wt. copper, oz.	Net wt., lb.	Crated wt., lb.
10	9 1/8	4	5	11 1/2	24	18	15	20
12	11	4 3/4	5	14 1/4	24	18	20	25
14	12 7/8	5 3/4	5 1/2	15 1/2	24	18	30	30
16	14 3/4	6	5 1/2	17	24	18	35	40
18	16 1/2	6 3/8	6 1/2	19	24	18	45	55
20	18 1/2	7 9/16	6 1/2	21	24	18	50	65
24	22	9	6 3/4	24 1/2	24	20	60	80
30	27 1/2	11 5/16	9 1/8	30	22	24	120	175
36	33	13 1/2	11	34 1/2	22	24	160	240
42	38 1/2	15 3/4	11 1/4	41 1/4	20	28	225	390
48	44	18 7/8	11 1/4	46 1/2	20	28	320	465
54	49 1/2	20 1/4	13 3/4	47	20	28	485	690
60	55	22 1/2	15 1/2	61	20	28	560	750
66	60 1/2	24 3/4	16 3/4	62 1/2	20	28	650	825
72	66	27	16 3/4	67 1/2	20	28	780	1000

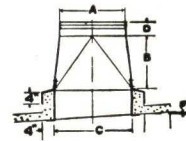
DIMENSIONS, WEIGHTS AND GAUGES OF SWARTWOUT BASES



Type A



Type B



Type C

A	B	C	D	E	F	Gauge iron	Wt. copper, oz.	Aver. net wt., lb.	Aver. crated wt., lb.
10	18	14	5	5	Required dimension slope per ft.	22	24	13	15
12	18	16	5	5		22	24	18	20
14	18	18	5	5		22	24	26	28
16	18	20	5	5		22	24	35	37
18	18	22	5	5		22	24	38	40
20	22	24	5	5		22	24	45	50
24	22	28	5	5		22	24	55	65
30	22	34	5	5		20	28	80	95
36	22	40	5	5		20	28	95	110
42	22	46	5	5		18	32	105	125
48	22	52	5	5		18	32	115	135
54	22	58	5	5		18	32	125	150
60	22	64	5	5		18	32	140	165
66	22	70	5	5		18	32	155	185
72	22	76	5	5		18	32	170	200

CONSERVATIVE AIR RATING OF SWARTWOUT ROTARY BALL BEARING VENTILATORS

Size of vent, in.	Cu. ft. per min.	Size of vent, in.	Cu. ft. per min.
12	275	36	2550
14	370	42	3400
16	490	48	4450
18	650	54	5500
20	800	60	6850
24	1100	66	8250
30	1700	72	9850

SOUTHERN WOOD PRESERVING COMPANY

ATLANTA, GA.

SALES OFFICES

NEW YORK, N. Y., 10 East 43rd Street
DETROIT, MICH., 726 Buhl Building
TOLEDO, OHIO, 25 No. Ontario Street

PITTSBURGH, PA., Dollar Savings & Trust Building
PHILADELPHIA, PA., Land Title Building
CHARLOTTE, N. C., 405 Builders Building

TREATING PLANTS: EAST POINT, GA. and CHATTANOOGA, TENN.

Products

CREO-PINE WOOD BLOCK FLOORS.

Also Creo-pine Subflooring, Wood Conduit, Cross Arms, Fence Posts and Poles.

Uses of Creo-pine Wood Block Floors

Creo-pine floors are used in factories, machine-shops, warehouses, loading platforms and other establishments where durability is an essential factor, and comfort to workmen and consequent increased human efficiency are items of consideration.

Qualifications of a Good Floor

(1) It should withstand surface wear and afford a smooth surface. (2) It should be resilient, free from vibration, non-conductive of heat and non-slippery. (3) It should not dust or crumble. (4) It should be sanitary and easy to clean. (5) It should adapt itself readily to repairs, not only to the surface but to subfloor work. (6) It should be impervious to decay and the action of oils, acids, etc.

Determining Factors of a Good Floor

(1) Blocks shall be made of select Southern yellow pine. (2) They shall be manufactured with mechanical precision to the proper size for service required. (3) They shall be impregnated with creosote oil in accordance with standard specifications. (4) They shall be correctly installed.

Creo-pine Floors Conform to the Ideal

Creo-pine floors meet the above qualifications, as the foregoing determining factors are embodied in each finished floor. The lumber used is the best obtainable Southern yellow pine, thoroughly air seasoned.

Blocks are carefully manufactured to correct size for service required and impregnated with creosote oil by use of the most modern wood preserving equipment. Creosote used is obtained wholly from pure coal tar and is in accordance with standard specifications. The installation is handled by experienced superintendents.

Further information and estimates gladly furnished.

Creo-pine

TRADE NAME
Registered

Specifications for Creo-pine Floors

Timber—Timber shall be air seasoned Southern Yellow Pine, square edged and sound, free from bark, loose or rotten knots, wormholes, shakes, check, or other defects detrimental to its strength or durability. It shall average not less than 6 annular rings to the inch measured radially and beginning 2 in. from the heart center.

Size—Blocks shall be truly rectangular, $2\frac{1}{2}$ to 4 in. wide, $5\frac{1}{2}$ to 9 in. long, and $2\frac{1}{2}$ or 3 in. deep (parallel to the fiber). A variation of $\frac{1}{8}$ in. shall be allowed in depth, and $\frac{1}{8}$ in. in width.

Only one width of blocks shall be used on any single floor.

Preservative—Creosote must be a pure coal tar product obtained entirely from coal gas or coke oven tar and must not contain any admixture of tar oils, petroleum or any other products. It shall be completely liquid at 38° C. and not more than 3% of the water-free oil shall be insoluble in chloroform or benzol. Specific gravity shall not be less than 1.05 and shall not exceed 1.14. When 100 grams of the creosote are placed in a retort and subjected to a distilling test as described in Bulletin No. 96 of the American Railway Engineering and Maintenance of Way Association, amount of distillation shall not exceed the following:

Up to 200° C., no distillate.
Up to 210° C., less than 5%.
Up to 235° C., not more than 25%.
Up to 315° C., not more than 50%.
The oil shall not contain more than 2% of water.

Treatment—Blocks shall be properly treated by pressure-vacuum-empty cell process by a creosoting plant properly equipped for such work, injecting not less than 16 lb. of oil per cu. ft. into blocks with a final retention of 6 to 8 lb.

Foundation—A concrete foundation shall be prepared from 4 to 6 in. thick, depending upon loads to which floor will be subjected, consisting of 1 part cement, 3 parts sand and 6 parts crushed stone or gravel, and brought to a smooth finish sufficiently below grade of floor to provide for depth of blocks.

Concrete must be brought to a smooth and true surface, allowing no coarse aggregate to show, as any unevenness will be apparent in the finished floor.

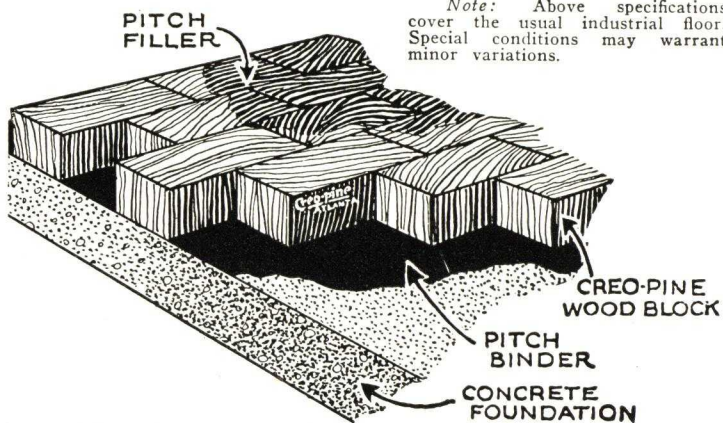
Bituminous Paint Coat—Upon the thoroughly cleaned and dried concrete base apply a coat of bitumen, spreading same smoothly with squeegees to a uniform thickness of not more than $\frac{1}{8}$ in.

Laying Blocks—Blocks shall be laid on the paint coat in straight parallel lines (at right angles to line of traffic) breaking joints not less than 2 in. and using only whole blocks, except to start and finish courses. Blocks shall be driven tightly together both on sides and ends.

Top Dressing—After blocks have been laid, a top coat of bitumen shall be squeegeed over top of the blocks and well into interstices between the blocks.

Sand Covering—The entire floor shall be covered with a thin coat of fine clean sand which shall be allowed to remain for several weeks.

Note: Above specifications cover the usual industrial floor. Special conditions may warrant minor variations.



Method of Installing Creo-pine Wood Block Floors



Plant of Illinois Glass Co., Bridgeton, N. J.

THE PHILIP CAREY COMPANY

Manufacturers of Carey Elastite Asphalt Plank

LOCKLAND, CINCINNATI, OHIO

BRANCHES AND DISTRIBUTORS IN PRINCIPAL CITIES

FACTORIES: LOCKLAND, OHIO, AND PLYMOUTH MEETING, PA.

Products

CAREY ELASTITE ASPHALT PLANK.

CAREY ELASTITE EXPANSION JOINT.

Also Carey Asphalt Primer; Carey Manco Asphalt; Carey Elastite Track Insulations; Carey Elastite Crossing Pavement.

For Built-Up Roofing, Pipe Covering, and Asbestos-Cement Corrugated Roofing and Siding, see Manufacturers' Index.



An Improved Flooring for Industrial Use

Elastite Asphalt Plank is a dense, hard, tough composition of asphalt, fibre and mineral, formed under pressure into planks of convenient dimensions. It is non-absorptive and proof against decay. It has no grain and does not swell, warp or shrink. It is durable, dustless and acid-resisting.

Elastite Asphalt Plank

Elastite Asphalt Plank may be applied over either old or new floors, and is readily laid over wood, concrete or other comparatively smooth substantial surface. It is almost unbelievably durable under severe traffic conditions, but is not recommended for use under stationary loads. It will not span across openings and must be firmly supported throughout its entire area.

Application—

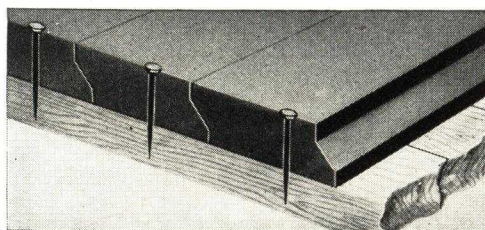
With only ordinary tools Elastite Asphalt Plank can be easily applied over any suitable surface.

Over Wood—

When laid over a wood floor the wood planks must be sound and uniform as to surface and firmly nailed without wide cracks between planks. The asphalt planks are laid in place, in straight lines, breaking joints, crowded up closely together, and nailed securely. Nails should be spaced not over 10 or 12 in. apart, staggered, with two nails in each end of each asphalt plank.

Sizes of nails used for each thickness of asphalt plank should not be less than the following:

Asphalt plank thickness, in.	Nail size
$\frac{1}{2}$	8 d.
$\frac{3}{4}$	12 d.
1	16 d.
$1\frac{1}{4}$	20 d.
$1\frac{1}{2}$	30 d.
2	40 d.

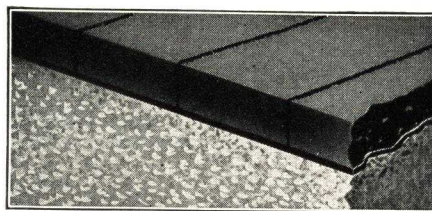


Over Wood Floors, Carey Elastite Asphalt Plank Is Simply Surface Nailed to the Subfloor

Over Concrete—

When Elastite Asphalt Plank is applied over a concrete base it is cemented in place with asphalt. Either hot asphalt pitch or cold emulsified asphalt are satisfactory, but general preference is for the emulsion.

A small area at a time is mopped with asphalt and the asphalt planks laid carefully in a neat



Carey Elastite Asphalt Plank Is Cemented to a Concrete Base by Applying It in Hot Asphalt

workmanlike manner, breaking all joints. Each individual asphalt plank is to be crowded up closely against adjacent planks so that side and end seams are reasonably tight.

Sizes—

Standard Thicknesses— $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ and 2 in.

Standard Widths—6 and 8 in.

Standard Lengths—3 ft. for $\frac{1}{2}$, $\frac{3}{4}$ and 1-in. thicknesses. 6 ft. for other thicknesses.

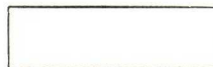
Special thicknesses, widths and lengths can be supplied promptly as required.

Standard Shapes—

Straight Side section, recommended for all general use.

Modified Ship-lap section, preferred by some purchasers. This shape should not be used in connection with asphalt application.

With exception of $\frac{1}{2}$ and $\frac{3}{4}$ -in. thicknesses, which are made in Straight Side section only, all standard thicknesses are available in either Straight Side or Modified Ship-lap section.



Straight Sides



Modified Ship-lap

Shapes of Carey Elastite Asphalt Plank

Elastite Expansion Joint

Elastite Expansion Joint has for many years been specified and used in pavements, roofs, floors, bridges, reservoirs, swimming pools, walls, dams, and other structures where provision for expansion is advisable.

It is furnished in thicknesses, widths and lengths as desired. It can also be supplied cut to special shapes or formed to meet unusual conditions of installation, arriving on the job ready to use.

It is cheap; easy to handle and install; does not stick together in summer or become brittle in winter; it is used without loss or waste; and once installed becomes an integral part of the work, functioning efficiently as long as the structure itself endures.

Ask for the Facts

A telephone call or letter to the nearest Carey Branch Office or Distributor will bring you a sample and further information.

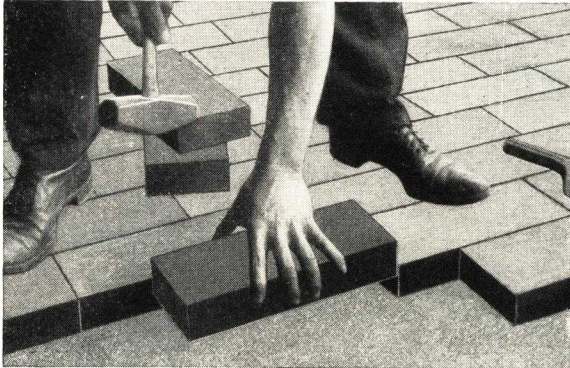
ASPHALT BLOCK PAVEMENT COMPANY

Manufacturers of Flooring and Paving Blocks

Board of Trade Building
TOLEDO, OHIO

Products

COMPRESSED ASPHALT FLOORING BLOCKS
COMPRESSED ASPHALT PAVING BLOCKS
COMPRESSED ASPHALT TILES



AN IDEAL FLOOR AND PAVEMENT MATERIAL
FOR FACTORIES—MILLS—LOADING DOCKS
PUBLIC BUILDINGS—SERVICE AREAS
FREIGHTHOUSES AND WAREHOUSES
BRIDGES—PIERS—AIRPORTS
STREETS AND DRIVES
COURTS—TERRACES
ROOF DECKS

A Word of Caution to Engineers and Architects

Good asphalt blocks cannot be made without incorporating a *graded rock aggregate* of the highest quality, nor can they be properly compressed without the use of powerful block presses especially designed for the purpose. These fundamental facts, proven beyond question, are offered for your protection and should be kept in mind when drawing up open specifications.

Description

The asphalt blocks manufactured by this company are the net result of over forty years' experience in this field exclusively. A precise laboratory technique prevails at our factory and we unconditionally guarantee our products equal to the highest standards of asphalt block production. Nothing is left to chance. We scientifically combine a carefully processed rock aggregate and refined asphalt in such a manner as to produce a gritty, homogeneous mass, absolutely uniform in texture throughout. This asphalt block mix—representing many years of experience and laboratory research—is then passed through the hydraulic block presses at 300° Fahrenheit to receive a block pressure of 4000 pounds per square inch. The finished product represents the utmost in a durable asphaltic paving and flooring material.

Lack of space prevents printing our usual list of typical jobs but reference, covering any field, will be mailed upon request.

Standard Asphalt Block Sizes

5x12x2 in. (deep) asphalt blocks are usually specified for floor and pavement areas subject to extremely heavy service.

4x8x1¼ in. (deep) asphalt blocks are also designed for hard service but are usually specified for certain buildings where dead weight and depth of wearing surface are factors.

Compressed asphalt tiles—square or hexagonal—can also be supplied for such special areas as walks, courts and terraces.

Roof Decks

Asphalt blocks or tiles can be laid successfully on roofs and similar areas intended for foot or automobile traffic. Our products have proven to be especially satisfactory on such jobs because they are not affected by extreme weather conditions.

Waterproofing Protection

Many railroads also use our asphalt blocks for the protective course over waterproofing on grade elimination structures. The 4x8x1¼-in. blocks provide a dense shield which protects the waterproofing mat perfectly as long as the structure lasts. A protection course like this will never rot, check or lose life.

Method of Laying Asphalt Blocks

The installation of asphalt blocks is a simple procedure and numerous contractors lay the material with their own forces. However, we are always glad to furnish a reliable superintendent, or some skilled block layers, to help in the operation whenever such service is desired. We are in position, also, to bid on installations complete whenever job conditions and location permit us to operate effectively with our own force. These flooring and paving blocks are usually installed over a concrete base although they can be securely laid on any other stable foundation. The accepted practice is to strike off a mortar bed, not less than one-half inch deep, on the concrete base and then proceed to lay the blocks immediately on this bed—which is composed of one part cement to two and one-half parts of sharp, coarse sand, well mixed and slightly dampened. Bed the blocks tightly together and to a smooth top surface. When the block laying is finished, fill the joints thoroughly with an approved asphaltic filler or a thin, neat cement grout, depending largely on the type of job and character of service.

Special Non-Skid Construction

Although our asphalt blocks provide a non-skid surface even when laid with tight joints in the regular manner, a special method of laying the blocks with spaced recessed transverse joints has been developed for grades and other dangerous locations, where complete freedom from skidding is essential especially under the most adverse conditions. This non-skid construction insures absolute safety in all kinds of weather and is ideal for bridge and viaduct approaches, industrial ramps, hillside pavements, sharp curves and traffic stop intersections.

A set of our standard specifications, covering physical makeup and method of installation, will be mailed to you upon request.

INCORPORATED 1885

THE HASTINGS PAVEMENT COMPANY

TELEPHONE
WHitehall 4-9140

25 Broad Street
NEW YORK, N. Y.

WORKS
HASTINGS-ON-HUDSON, N. Y.

The Company

THE HASTINGS PAVEMENT COMPANY is a pioneer in the field of asphalt paving. Continuously for nearly half a century its asphalt blocks and tiles have been manufactured at the company's large permanent plant and shipped to all parts of the country and to many foreign states.

Asphalt Blocks

Made under strict laboratory and technical control, asphalt blocks are composed of hard crushed rock, stone dust and specially processed asphalt cement, carefully proportioned, heated, mixed and shaped into tough, dense, shock-absorbing and moisture-proof block units at a minimum pressure of 4,000 lbs. per sq. in. They are furnished in the following sizes and weights:

Size, in.	Weight, lbs.				Blocks per sq. yd.		Sq. yds. per thousand blocks		Weight per thousand blocks, tons	
	Per block	Per sq. ft.		Per sq. yd.		Reg.	Non-skid	Reg.		Non-skid
		Reg.	Non-skid	Reg.	Non-skid					
5x12x2 (deep)	10.6	25.4	23.2	228	209	21.5	19.7	47.0	51.0	5.3
5x12x2½ (deep)	13.5	31.8	29.6	290	266	21.5	19.7	47.0	51.0	6.75
5x12x3 (deep)	15.85	37.6	34.7	341	312	21.5	19.7	47.0	51.0	7.93
8x4x1¼ (deep)	3.5	15.5		140		40.0		25.0		1.75
*Hexagonal tile	10.9	25.1		229		21.0		48.0		5.45
**Square tile	11.5	24.7		232		20.2		49.0		5.75

*8½ in. between parallel sides by 2 in. (deep). **8x8x2 in. (deep).

Applications

Asphalt Blocks provide an ideal surfacing for industrial and warehouse floors, piers, loading platforms, rail terminals, bridges, roof decks, streets, drives, walks and for waterproofing protection.

Heavy-Duty Floors and Pavements—The 5x12x2-in. blocks ordinarily fulfill all requirements of heavy duty service. Where exceptional traffic or construction conditions prevail, the 5x12x2½ or 3-in. blocks may be substituted.

Roof Decks and Upper Floors—On installations of this kind, where weight and thickness of surface are necessary considerations, the "Eightfour" (8x4x1¼ in.) will meet all service requirements whether subjected to hard traffic or intended for storage or recreational use.

Waterproofing Protection—Laid over the waterproofing fabric on bridges and viaducts, "Eightfour" Asphalt Blocks provide a dense, tough protective seal against water seepage and damage from fragments of rock ballast.



Asphalt Block Non-Skid Construction

For ramps, bridge approaches and roadways with grades, curves or hazardous crossings, Asphalt Block Non-Skid Construction provides unfailing security against skidding in any kind of weather. It attains its effective non-skid property through use of a specially constructed recessed transverse joint approximately ½ in. wide and ½ in. deep between each row of blocks.

Asphalt Tiles

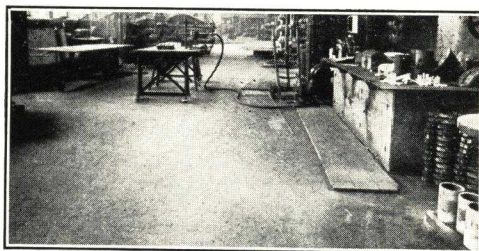
In parks, cemeteries, schools and public grounds, walks and terraces paved with Hexagonal Asphalt Tiles edged with borders of Square Asphalt Tiles combine exceptional durability with attractiveness. Tile walks which have been in use for forty years or more are not uncommon.

Laying Asphalt Blocks

Upon the prepared foundation, the Asphalt Blocks are usually laid in a bed of cement mortar ½ in. thick struck to a uniformly smooth surface. If the foundation surface has been screeded to a true finish, the blocks may be laid directly thereon in an asphalt mop coat without use of compensating cushion. On the asphalt mop coat or cement mortar bed, the blocks are immediately laid tightly together (except in Non-Skid Construction as above noted) with joints broken by a 4-in. lap. An application of emulsified asphalt to fill the joints, completes the installation.

Some Representative Installations

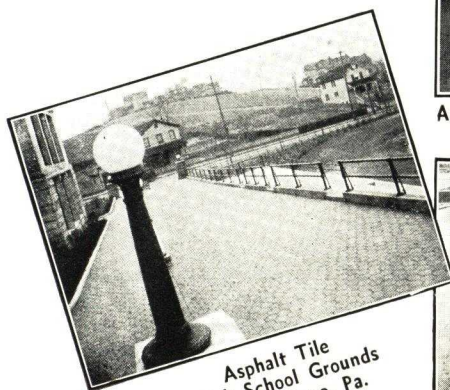
Westinghouse Electric & Mfg. Co., Manufacturing Plant, Essington, Pa.
United States Navy, Floors, Navy Yards, Brooklyn, N. Y., Boston, Mass.
New York Central R. R. Co., Warehouse, New York, N. Y.
City of Philadelphia, Pier No. 84, Philadelphia, Pa.
Western Maryland R. R., McComas Street Pier, Baltimore, Md.
Bush Terminal Co., Pier, New York, N. Y.
United States Army, Pier, Brooklyn, N. Y.
Arbuckle Brothers, Platform, Brooklyn, N. Y.
Canadian Pacific Rwy. Platform, Three Rivers, P. Q., Canada.
New Jersey State, Victory Bridge, Perth Amboy, N. J.
Pennsylvania R. R., Viaducts Sunnyside Yards, New York, N. Y.
York & Lancaster Counties, Pa., Susquehanna River Bridge.
Port of N. Y. Authority, Freight Platforms, Inland Freight Terminal, New York, N. Y.



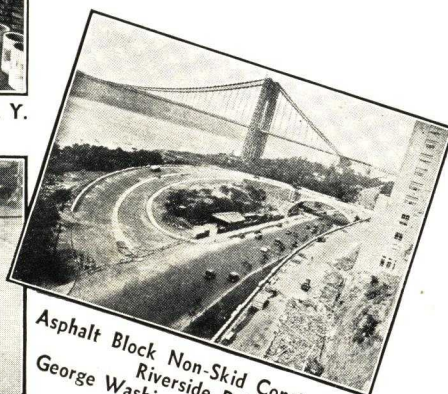
Asphalt Block Floor, U. S. Navy Yard, Brooklyn, N. Y.



Protecting Railroad Bridge Waterproofing with Asphalt Blocks, D. L. & W. Rwy. Co.



Asphalt Tile
High School Grounds
Wilkes-Barre, Pa.



Asphalt Block Non-Skid Construction
Riverside Drive
George Washington Bridge Approach
New York, N. Y.

ESTABLISHED 1912

UVALDE ROCK ASPHALT COMPANY

Manufacturers of Expansion Joints, Flooring, Waterproofing Planks and Asphalt Floor Tile, Miners of Limestone Rock Asphalt

GENERAL OFFICES

Frost National Bank Building, SAN ANTONIO, TEX.

MINES: BLEWETT, TEX.

ASPHALT PRODUCTS PLANT: HOUSTON, TEX.

Products

UVALDE ROCK ASPHALT and DURACO Paving Materials.

URAFILLER (Finely pulverized Limestone Rock Asphalt).

AZROCK Fiber Mastic Expansion Joint.

AZROCK Asphalt Plank and Waterproofing Protection Courses.

AZROCK Paving Tile (Industrial Flooring).

AZROCK Asphalt Floor Tile.

AZROCK Asphalt Mastics.

UVALDE ROCK ASPHALT

(Reg. U. S. Pat. Off.)

AZROCK

(Reg. U. S. Pat. Off.)

DURACO

(Reg. U. S. Pat. Off.)

Azrock Fiber Mastic Expansion Joint

AZROCK Fiber Mastic Expansion Joint is made from URA-FILLER (UVALDE ROCK ASPHALT

Dust), cotton fiber and pure asphalt. AZROCK Fiber Mastic Expansion Joint possesses high flexibility, yet can be readily handled, without deformation, during installation. Remarkably resistant to changes in temperature, it does not become hard and brittle in cold weather, nor is it soft and sticky in warm weather. It is waterproof. Another important characteristic is that, although being a dense, compact bituminous mass, it has ability to recover after compression. This probably is due to the presence of cotton fiber, together with the relatively low percentage of non-compressible asphalt—as differentiated from similar products.

Most premoulded expansion joints make use of supporting encasements, usually in the form of felt saturated with asphalt to serve as "sandwiches." This method is undesirable, as it prevents the joint from bonding to the contact surface. AZROCK Fiber Mastic Expansion Joint is one uniform mass throughout. No supporting encasements are used because the AZROCK Joint in itself has sufficient strength and rigidity, coupled with flexibility, to withstand any temperature changes or rough usage in handling and installation, without breaking or becoming unduly distorted.

AZROCK Fiber Mastic Expansion Joint makes the following claims to superiority:

1. Marked resistance to temperature changes.
2. Unusually high tensile strength.
3. More flexibility and ductility.
4. Practically no water absorption.
5. Better compressibility and tendency to recover.
6. Greater resistance to wear of traffic.
7. Does not become soft and sticky in hot weather.
8. Stronger adhesion to contact surfaces.
9. Will not flow when used on inclines.

10. Less deterioration from age and weathering due to the proven long life of its principal ingredient, UVALDE ROCK ASPHALT.

Sizes—Standard dimensions of Expansion Joint range from 1 in. to 12 in. in width, $\frac{1}{4}$ in. to 1 in. in thickness and lengths up to 7 ft.; other widths and thicknesses may be secured.

Paving and Patching Materials

As the oldest and largest producers of Limestone Rock Asphalt in the United States, this company has been a pioneer in the development of this class of paving materials and has a large plant ready to produce both crude rock asphalt or a variety of premixed paving products, ready for use.

DURACO is a scientifically blended ready-mixed, non-skid paving material suitable for both paving and patching. In addition to its use in the strictly paving field, it has been found to be extremely valuable in the repair of industrial floors and in the surfacing of loading platforms, docks, railroad crossings, etc. This material is shipped either in bulk carloads or in sacks or barrels and may be stored for long periods without deterioration. It is easily and quickly applied, is moderate in cost and will give satisfaction when laid over any type of stable base.

Urafiller

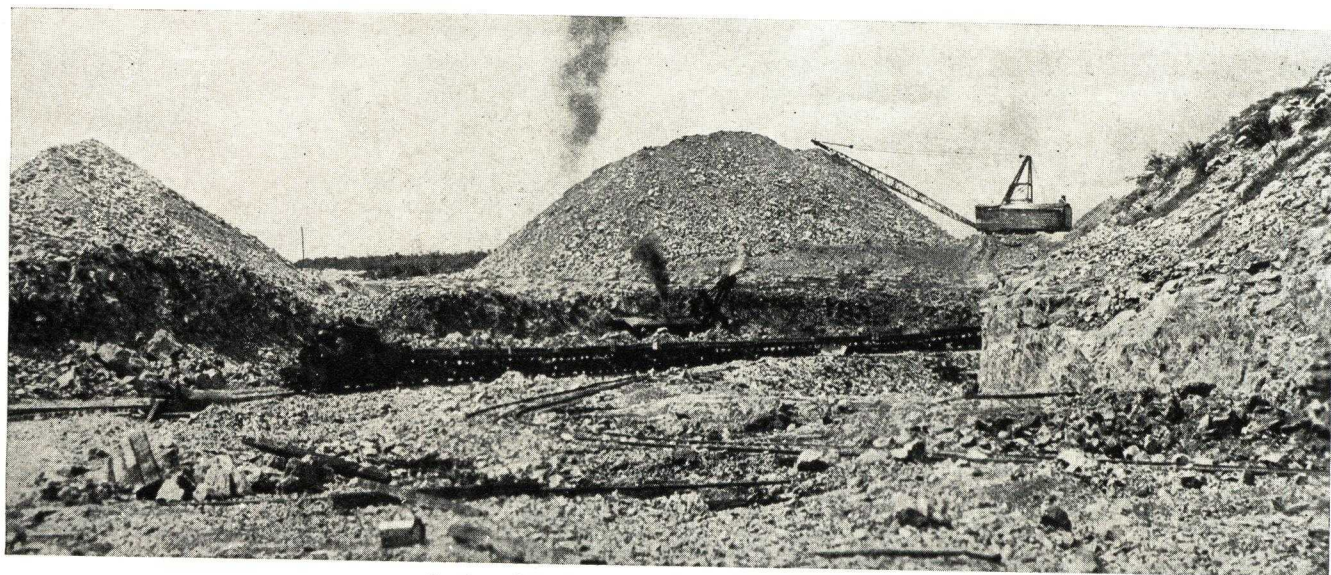
URAFILLER is finely pulverized Limestone Rock Asphalt and has been found valuable in mastics, as a filler in asphalt pavements, moulding compounds, paints, gear grease, etc.

Analysis of Urafiller

URAFILLER contains from 9% to 12% hard, native asphalt and the balance is limestone of such fineness that 97% passes 200 mesh screen after the bitumen has been extracted.

Screen Test of Urafiller with Bitumen Present

Passing 325 mesh	55%-70%
Passing 200 mesh and retained on 325 mesh	13%-25%
Passing 80 mesh and retained on 200 mesh	14%-17%
Passing 40 mesh and retained on 80 mesh	3%-8%
Specific Gravity at 77° F.	2.27-2.23



Section of the Company's Mines Near Uvalde, Tex.

Huge deposits of limestone rock asphalt supply UVALDE ROCK ASPHALT COMPANY with the basic material for its varied products

Azrock Asphalt Plank and Waterproofing Courses

AZROCK Asphalt Planks consist of a uniform, dense, hard, tough composition of finely pulverized UVALDE ROCK ASPHALT (URAFILLER), cotton fiber and liquid asphalt and are made up under extreme pressure. These planks will not shrink, swell, warp or check and due to the thorough impregnation with asphalt, the material will not decay. These planks are much harder and tougher than other types of asphalt planks and are less affected by climatic changes, not becoming as soft at high temperatures nor as brittle at low temperatures.

AZROCK Asphalt Plank is intended primarily for use as wearing surface on bridges, viaducts, alleyways, trucking aisles and other locations where the loads are all furnished by moving traffic. It is not intended for use where the floor will be subjected to standing heavy loads. Stationary loads will, after a period of time, cause indentations in the surface which are sometimes objectionable if they remain; however, if there is sufficient traffic passing over these indentations they will be quickly obliterated—in other words, the characteristics of AZROCK Asphalt Plank that may render it unsuitable for standing loads become very desirable under exposure to moving traffic which smooths out irregularities and brings the surface to a smooth, even texture.

While the primary use of AZROCK Asphalt Plank is as a wearing course for moving loads, it is also well adapted as a waterproof protection course for viaducts and bridges, roofs, promenade decks, tunnels, walls and swimming pools. Likewise, it serves as a vibration protection course for machinery foundations, railroad bridges and viaducts.

It should be remembered that AZROCK Asphalt Plank is a wearing surface only. These planks will not span openings or irregularities. They must be firmly and continuously supported throughout the entire area over which they are laid. Due to the nature of the material, it is sufficiently plastic that it will accommodate itself to the shape of the supporting structure. It is therefore essential, in order to secure best results, that a smooth, approximately plane surface be provided over which AZROCK Plank is to be laid. AZROCK Plank should never be laid over an old, worn, irregular floor as it will soon conform to every irregularity in the surface and the result would be extremely disappointing. AZROCK Asphalt Plank may be applied over any supporting surface to which it can be suitably secured. In practically all instances, this will be wood or concrete and the methods which apply to laying on wood or concrete can, with some modifications, be used on any unusual installation that may be encountered. Ordinarily AZROCK Planks will be nailed to wood sub-floors and cemented to concrete or other type sub-floors.

AZROCK Asphalt Planks are recommended for Bridge Floors, Railroad Crossings, Flooring in Ice Vaults or refrigerated rooms, flooring of Ice Wagons, Waterproof Protection Courses, runways or aisles in industrial Plants, Loading Platforms, Industrial Elevator Floors, Platforms, Scale Floors, Wharves, Tennis Courts, Sidewalks, Air Port Runways, etc.

Advantages of AZROCK Asphalt Planks:

Noiseless	Non-Dusting
Resilient	Easy to walk or stand on
Fire-Resisting	Waterproof
Shock and Vibration Absorbing	Durable

Weight should be computed on basis of 9 lb. per sq. ft. per 1 in. thickness.

Standard Sizes—Thicknesses range from $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ to 1 in. and standard width is 12 in., while standard lengths are 4 ft. AZROCK Asphalt Planks are available in different grades of hardness depending upon the use for which they are intended.

Azrock Industrial Tile

AZROCK Paving Tile is a fibrated asphalt product consisting of a uniform mixture of finely pulverized UVALDE ROCK ASPHALT (URAFILLER), cotton fiber, and liquid asphalt, formed under high pressure. The asphalt in these tile has a high melting point and the tile are hard enough to resist standing loads, yet are resilient and highly resistant to wear.

Uses—For warehouses, factories, shops, freight houses, textile mills, baggage, mail and express rooms or cars, gymnasiums, loading docks, printing plants and all locations where the floors are subjected to trucking, standing loads or concentrated foot wear—in fact, wherever a heavy-duty industrial floor with long life and smooth surface is needed.

Advantages—AZROCK Paving Tile floors are durable, quiet, resilient, fire-resisting, waterproof, non-slip, non-dusting, insulating and vibration absorbing. AZROCK Paving Tile provide a smooth, clean, slip-proof, non-shattering attractive floor adapted to any type of construction either old or new. While repairs are seldom needed on this type of floor, re-conditioning or repairing may be quickly and easily done with very little expense. AZROCK Paving Tile do not swell, warp or check and are little affected by climatic changes.

Sizes and Colors—AZROCK Paving Tile are supplied in $\frac{3}{8}$ in. and $\frac{1}{2}$ in. thicknesses and in 12x24 in. size only, die cut to assure true, square edges for close laying. Weights 4 lbs. and 5 lbs. per sq. ft.

These tile are furnished in both black and red so that, where desired, variations in color may be secured.

Application—AZROCK Industrial Tile may be laid over practically any type of uniformly smooth, stable sub-floors such as wood, concrete, steel, etc., and are closely laid on an asphalt cement. Because of their characteristics and the method of application, they may be applied below the ground surface or in damp locations.

Special Information—Information or suggestions for unusual industrial floor installations will be gladly furnished. Write us, giving full information as to the use of floor, area, type of sub-floor, etc.

Azrock Asphalt Mastic

AZROCK Mastic is a high-grade, tenacious, ductile asphalt with particles of microscopic limestone held in suspension and thoroughly distributed throughout the mass, whose principal constituent is URAFFILLER (finely pulverized UVALDE ROCK ASPHALT).

AZROCK Mastic, being composed principally of a natural asphalt, has a high melting point, thus resisting flow in warm weather and at the same time the asphalt is not brittle, and the fact that the fine mineral filler is carried uniformly throughout the mass causes this material to resist actions of the low temperatures, refusing to check or crack open. AZROCK Mastic, unlike mastics made from refined asphalts, will not decompose or deteriorate when subjected to water.

AZROCK Mastic is particularly recommended for:

- Expansion Joint and Crack Filler
- Protective Coating for Wood, Metal and Masonry
- Insulating
- Flume and Culvert Linings
- Roof Pitch in Built-Up Roofs
- Roof Flashings
- Dampproofing and Waterproofing Walls, Culverts, etc.
- Protective Coating for Pipelines.
- Protection and Waterproofing of Metal and Wooden Tanks
- Cement for Mastic Floors

The above uses are only a few for which AZROCK Mastic is applicable. It will be found suited to practically all purposes where asphalt, pitch, or tar might be used.

AZROCK Mastic is available in different grades, depending upon the use for which it is intended.

Azrock Asphalt Floor Tile

AZROCK Asphalt Flooring Tile was developed to meet a real need for a handsome, resilient floor covering—priced in keeping with the times.

A distinctly new type of flooring material, AZROCK Flooring Tile consists of a dense tough composition, the principal ingredients of which are UVALDE ROCK ASPHALT, cotton fiber and coloring matter. This mass is uniformly mixed and formed under extremely high pressure by passing through rolls, after which it is cut to standard sizes with true edges. Color goes all the way through.

The finished product is a tile of exceptional beauty and one which at the same time possesses rugged wearing ability. It is tough, smooth and resilient and only slightly affected by extremes of temperature. Due to its thorough impregnation with asphalt, AZROCK Flooring Tile is practically non-absorbent. The random interlacing of cotton fibers forms a natural reinforcement.

One of the most appealing features of AZROCK Flooring Tile is its variety of colors, which lend themselves so admirably to the creation of beautiful and harmonious patterns. In addition to the solid colors, there are mottled or marbled colors from which to choose. All have a mellow richness which gives an air of quiet distinction to the floor area where the tile is installed.

AZROCK Flooring Tile is ideal for use in offices, stores, cafes, banks, hospitals, churches, libraries, schools, post offices, court houses, city halls and other public buildings, as well as in homes. When laid, the tile forms a smooth, durable and noiseless floor and with the range of colors available it will fit into any decorative scheme.

An outstanding advantage of AZROCK Tile as a flooring material is that it does away with that tired feeling caused by walking or standing on a hard, non-resilient floor. It has sufficient "give" to be silent and restful while possessing the durability to withstand heavy foot traffic.

The economy of AZROCK Flooring Tile will impress you most favorably. Not only is its initial cost less than that of many ordinary materials, but, once laid, it forms a lifetime floor. The tile may be installed on a variety of sub-floors—in fact, over any surface that is smooth, solid and free from cracks and holes. It is equally well adapted to new or old construction. The tile can be had in two thicknesses— $\frac{1}{8}$ in. or $\frac{3}{16}$ in.

In working out appropriate designs and combinations, the services of our experienced dealers are at your command. These same dealers have expert workmen who will install the tile.

THE E. F. HAUSERMAN COMPANY

Manufacturers of Movable Steel "MasterWalls" and Partitions
Planning, Engineering and Erection Service

6990 Grant Avenue, CLEVELAND, OHIO

DIRECT FACTORY BRANCHES

ALBANY, N. Y.
BOSTON, MASS.
BUFFALO, N. Y.

CHICAGO, ILL.
DETROIT, MICH.
KANSAS CITY, MO.

NEW YORK, N. Y.
NEWARK, N. J.
PHILADELPHIA, PA.

PITTSBURGH, PA.
ST. LOUIS, MO.
WASHINGTON, D. C.

Product

HAUSERMAN MOVABLE STEEL PARTITIONS and "MASTERWALLS" for dividing and subdividing every type of monumental, office, institutional, administrative, apartment, research and industrial building—ceiling high, cornice high and junior partitions, office railings, window embrasures, radiator enclosures and hospital cubicles, complete with perfected accessories including doors, transoms, transom operators, ventilators, grilles, wickets, counters, hardware, etc.—all designed and manufactured by Hauserman, and finished in hundreds of exclusive Hauserman colors or photographic duplications of natural grains.

The Company and Its Experience

THE E. F. HAUSERMAN COMPANY is the world's largest manufacturer of movable steel walls and partitions. For over fifteen years this organization has devoted itself exclusively to design study, development engineering; manufacturing and erecting methods of movable steel walls and partitions for every purpose. And by working in close cooperation with the Architectural and Engineering professions, Hauserman Engineers have found practical solutions for every kind of interior wall and partition problem. As a result, today more Hauserman Products are in use than all other makes combined. THE HAUSERMAN COMPANY offers co-operative assistance in office layout and will gladly prepare decora-

tive suggestions. Ask for copy of "Office Planning Studies."

National Service

THE E. F. HAUSERMAN COMPANY maintains its own factory trained Service Organizations in every section of the country. Its conveniently located Branch Offices are manned by experienced engineers whose services are immediately available. Each branch is equipped to thoroughly and quickly handle original installations, re-arrangements and additions—no job too small—no job too large. The company assumes undivided responsibility for each job—assuring complete satisfaction—all work is done by Hauserman Erection Crews.

Permanent Appearance and Movability

The only types of interior walls that can be truly termed "permanent"—which survive the inevitable floor layout changes—are movable steel walls and partitions. Money invested in built-up walls or partitions of masonry is a total loss with any re-arrangement. All parts of Hauserman steel walls and partitions are salvageable. They outlive any building—permanent factory finishes practically eliminate maintenance. The more they are re-arranged, taken down, added to and re-erected, the more dollars they earn.

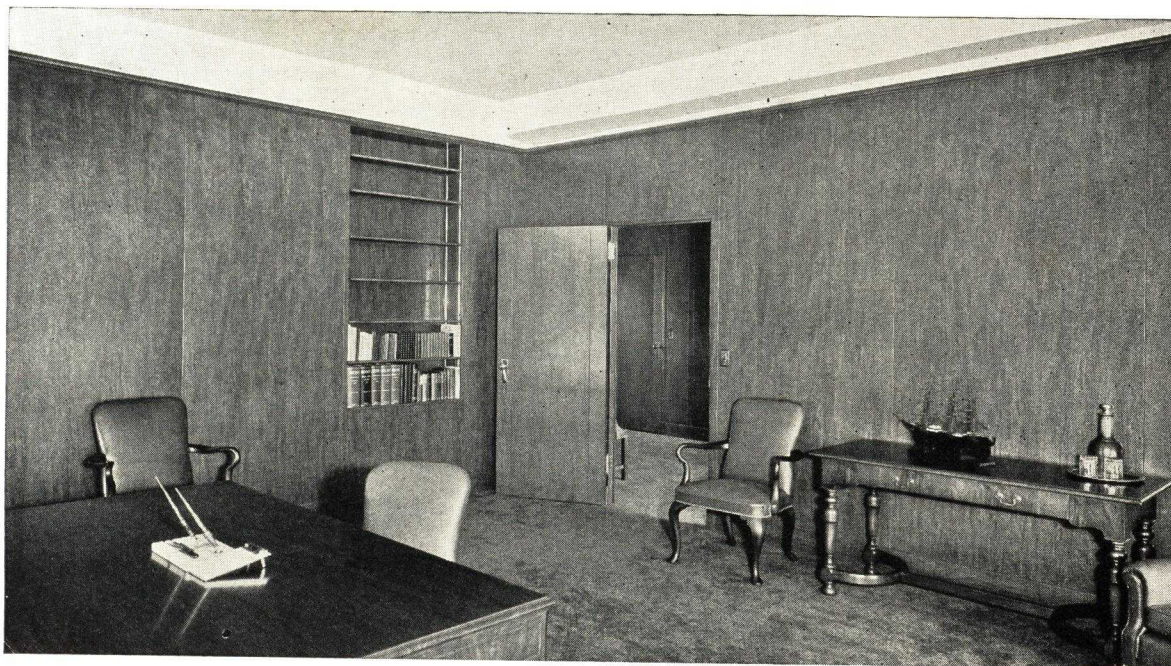
Hauserman Movable Steel Partitions

The complete line includes types AA, CC, W, WW, K, HK, T and R. Details furnished upon request.

It's the many exclusive patented features—built into Hauserman Steel MasterWalls and Partitions—that give them EXTRA VALUES and make them a finished product and a PERMANENT ASSET

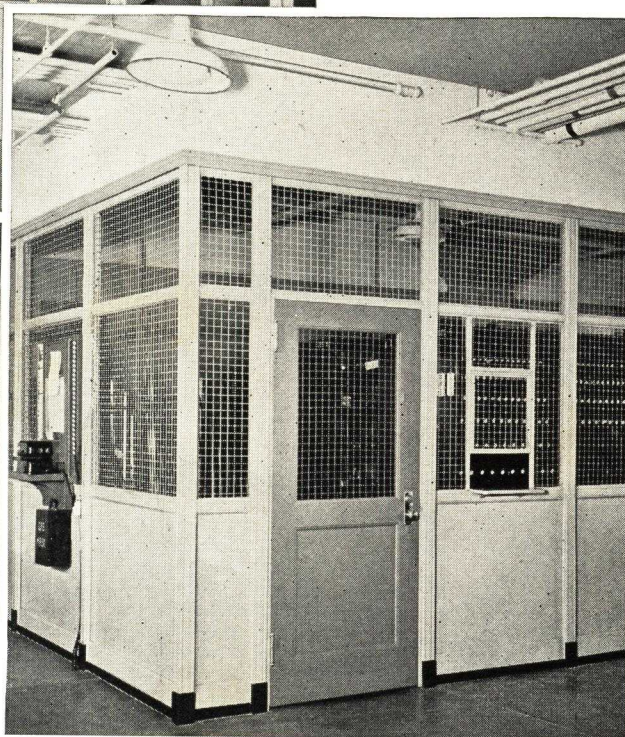
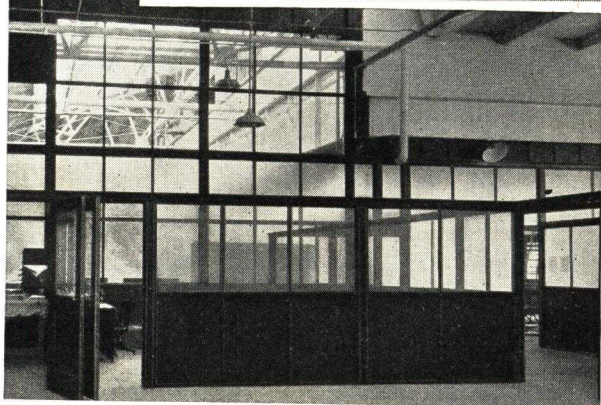
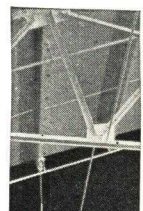
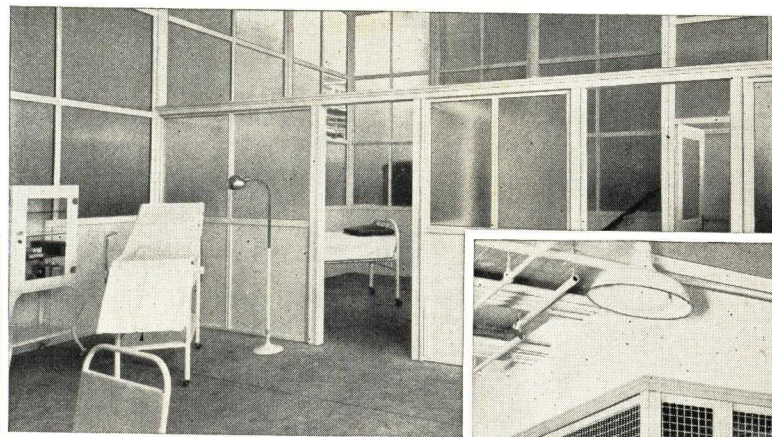
1. Standard panels are stocked in seven heights and eleven widths, in multiples of three inches in height and five or six inches in width.
2. Doors, bases and plinths, float independently permitting adjustment to uneven floors or various thickness of floor coverings without cutting any portion of the partition or door.
3. Base is either floating itself or provided with an adjustable floor mould which permits adjustment to uneven floors or floor coverings at any time.
4. Cornice has an internal expanding pull-up splice insuring strength and a perfect joint.
5. Panels have telescopic glazing stops, which are integral parts of the units—(no screws or loose moulds).
6. Floor connections are concealed and provide for extending partitions in any one or all four directions from any pilaster without disturbing adjoining partitions, cornice, or top filler.
7. Panels and/or doors of various sizes can be interchanged or rearranged to relocate doors or intersecting partitions without disturbing other panel units, cornice or top filler.
8. Post caps, plinths, base and corner moulds snap on securely concealing all methods of assembly.
9. Picture hooks for hanging heavy maps, charts and pictures are inserted at any time into inconspicuous slots in the soffit of the transom rail or top rail.
10. Partition members carry and conceal electric and telephone wires and cables. Bases are easily opened for "lay-in" wiring, and "lay-in" wires are as easily removed as installed.
11. The tie rod assembly of partition units makes it practical to "cut down" a unit in height or width at any time as may be required to meet unexpected conditions, and thereby saves the time and expense required for shop fabrication of special units.
12. Panel Plates are "patent leveled" furniture steel. All other members are full cold rolled, full finished strip steel.
13. Units are either all steel, steel and glass or steel and wire mesh, and are interchangeable at any time.
14. Either single or double doors are furnished, any swing. Doors may be of a single or two panel type, either all steel, glass, or steel and glass. They are all mortised for standard hardware, and all Hauserman standard lock sets are interchangeable at any time.
15. Grilles, wickets, ventilators, transoms or blackboards may be installed in any partition unit. Transoms and ventilators are controlled mechanically with the concealed self locking operator. (Hauserman perfected and built.)

A partition for every place and purpose



Partitions are made in either flush or moulded types for executive and general offices, with soundproofed panels. They can be finished in plain colors, stippled or faithful duplications of natural grains.

The line of Industrial Partitions provide for quick and economical rearrangements. They are built for service, fireproof and sanitary—furnished in all steel or steel and glass. These units can be assembled into factory offices, time-keepers' booths, spray booths, first-aid room, tool rooms, etc.



Complete catalogue and full size details on request.

A partition for every place and purpose

THE AEROSHADE COMPANY

Wood Slat Window Shades

3393 Oakland Avenue, WAUKESHA, WIS.

AGENTS IN PRINCIPAL CITIES

AEROLUX WINDOW SHADES PROVIDE WORKING COMFORT AND VENTILATION

Aerolux Ventilating Window Shades are the ideal shades for factories, mills, laboratories, offices, schools or any place where protection against the sun's heat and glare must be combined with good light, ventilation and durability.

There is practical economy in the selection of these shades as we can readily prove.

Aerolux fabric is so ruggedly constructed that the shades are covered by a 10-year guarantee—yet they cost no more than an average awning.

Many Aerolux have been in service 18 years.

One factory superintendent who had used his Aerolux continually for 11 years recently said, "Aerolux have already cut our shade bill in two. There seems to be no wear-out to them." Consider these facts when the purchase of shades is being considered.

Convenience of Aerolux Shades

Aerolux fabric consists of thin basswood strips woven together with best fish net twine. Heavy mouldings are placed at top and bottom. Operation is by cords running through automatic lock pulleys which hold shades at any desired height. Lower end of raising cord rolls up with shade—no cords to dangle below sill.

Advantages

Aerolux Shades offer the following advantages:

10-year guarantee.

Better working light.

Keep the sun's heat outside the building instead of retaining it inside.

Allow better ventilation.

Take the place of both inside shades and outside awnings.

Rugged enough to stand hard use without upkeep or replacement.

AEROLUX
REG. U.S. PAT. OFF.
**VENTILATING
Window Shades**

Keeps rooms 5° to 15° cooler, and admits 50% to 70% more light than stained

Reasonable in first cost and cheapest in the last.

Adapted for use with any type of window.

Aluminized Finish

A lustrous finish that reflects 91% of the sun's heat rays back through the windows. Keeps rooms 5° to 15° cooler, and admits 50% to 70% more light than stained finishes. Remains bright indefinitely in spite of gases and industrial fumes which darken other finishes. Unusually sanitary because it offers little foothold for dust and may be washed almost as easily as tile.

Stained Finish to Darken Rooms

In rooms used for rubber, leather, colored paper storage, etc., where light has a deteriorating effect, stained shades are provided which will darken the room and still allow ventilation through open window.

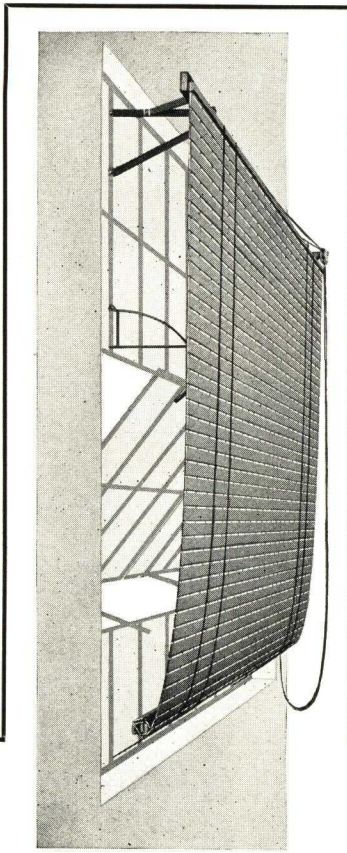
Shades for Horizontally Pivoted Windows

Projecting brackets suspend the shade away from sash. Ventilator guards prevent the shade from striking sharp corners on the ventilators. Guide cords draw the lower end of the shade toward the sill so that shade occupies minimum amount of room space—also prevents shade blowing into the room. No projecting brackets at bottom.

We loan tool to punch sash for easy attachment of fixtures.

Estimates

Our engineers, with 20 years' experience in industrial shading, will willingly co-operate in solving your shading problems and supplying estimates. When inquiring, please send specifications of sash or blue prints and state whether glass is clear or diffusing.



Type 5 Shades for Horizontally Pivoted Windows

Fabrics

De Luxe— $\frac{1}{2}$ -in. splints. Used for offices, schools, etc.

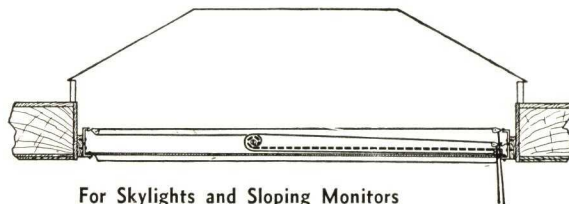
Grade A— $\frac{3}{8}$ -in. splints. Used for factories, mills, etc., where sturdier equipment is required.

Sizes

Made to order only in any width up to 20 ft. by almost any desired height.

Installation to Wood Windows

Simply screw the mounting strip to face or underside of top casing. Shades, pulleys and cords are completely assembled at factory.



For Skylights and Sloping Monitors

Operated either horizontally or on a slant. Shades supported on suitable T-bars. Operating cords may be extended to any convenient location.

Installation to Projected Windows

Brackets may be fastened either to bracket holes provided by sash manufacturer or bolted to muntin bar as illustrated. We supply sash punch for latter installation.

Left:

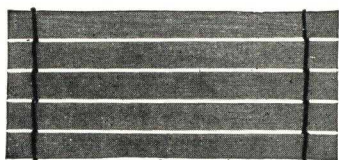
Standard Weave

This slightly open weave is one of the most popular for industrial use. Generally used for all purposes where window glass is of the ribbed or diffusing type. Frequently woven in combination, with "Suntite" at the bottom and standard weave at the top.

Right:

Suntite Weave

Note the splint edges are beveled to overlap. This eliminates "barred" light. Should be specified where fine work is done close to clear glass windows, as in drafting rooms, offices, or fine manufacturing of small parts.



HOUGH SHADE CORPORATION

Steel Window Ventilating Window Shades

166 North La Salle Street, CHICAGO, ILL.

FACTORY, JANESVILLE, WIS.

Product

VENTILATING WOOD FABRIC SHADES developed especially for application to all types of windows used in industrial buildings; particularly designed for the factory workroom and office, schools, hospitals, etc.

RA-TOX

**OFFSET WOOD FABRIC
SHADES FOR STEEL SASH**

Shade Fabric

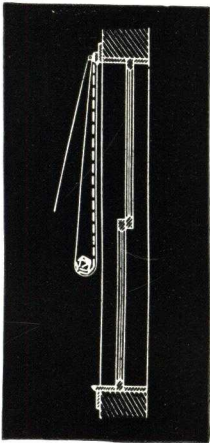
RA-Tox shades are staunchly constructed of beautifully and permanently stained wood strips, woven parallel with hard twist seine twine. Weatherproof, sunfast oil stains are employed. Constructed of stained wood strips, RA-Tox shades function as non-conductors of heat (a very important feature, especially in plants equipped with large areas of steel windows). Filtering the heat and glare from the sun's rays RA-Tox shades allow fully 30% to 40% more light and air to enter the shaded area than other type of shade. Their staunch construction insures satisfaction for 20 years or longer.

Fixtures

Raised and lowered by means of especially designed and patented fixtures, RA-Tox shades are easy to operate. A slight twist of the roll-up cord to the right unlocks the cord grip and allows you to raise or lower the shade. A slight twist to the left locks it securely at any point desired within the area of the window opening.

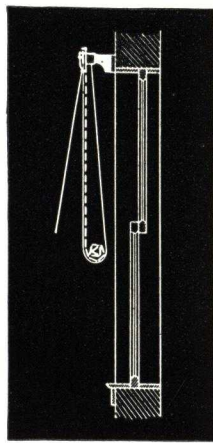
Brackets

Enameled steel brackets have been designed for all types of windows. All brackets are baked enameled in a color that



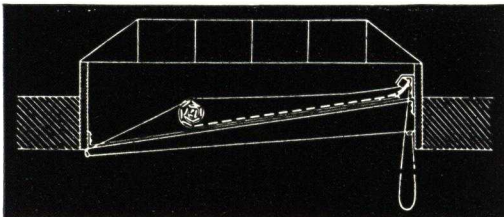
Wood Sash

Single pull cord shades are provided for narrow wood sashes. Shade stick is mounted directly to the trim overhead. A single center stop pulley is provided to control the shade.



Counterbalanced or Vertical Sliding

RA-Tox shades are mounted by means of short flanged brackets secured either to trim overhead, at side or, in the case of vertical sliding steel sash, to frame in which sash operates



Skylights

There are a great many different types of skylights. Suitable equipment has been developed to take care of the shading of all types.

Diagram illustrates the type of skylight generally found in modern industrial plants

harmonizes with the color of shade fabric selected. The illustration to the right shows method employed when shading center pivoted type windows used so extensively in modern factory construction.

Seven Advantages You Get in Ra-Tox

(1) Offset brackets permit independent freedom of movement for center pivoted type ventilators—insure perfect ventilation without drafts and wind.

(2) Twenty years and more of shade satisfaction.

(3) Permanent metal-to-metal installation—prevents all loosening due to vibration of walls or ceiling.

(4) 30% to 40% more light and air.

(5) Quick, simple, fool-proof operation.

(6) Made of selected basswood strips, woven parallel with hard twist seine twine; attractive fast colors add smart, business-like appearance.

(7) Reduces room temperature 10 to 20 degrees.

Installation

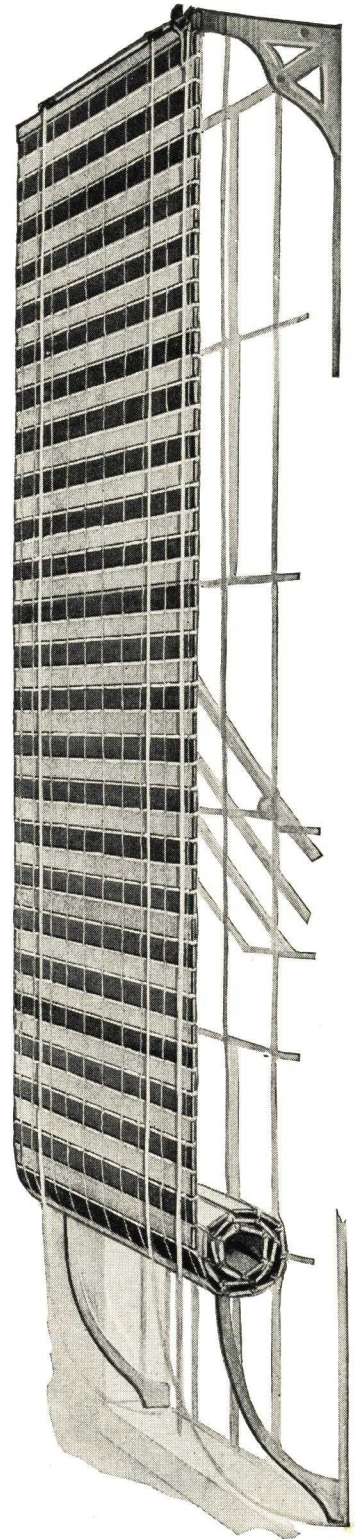
By employing tools especially developed and controlled by the HOUGH SHADE CORPORATION, perforations are made directly in ribs of window, making it possible to secure enameled steel brackets directly to window. No drilling or boring of concrete is necessary. This method of installation greatly reduces installation costs when shading steel windows.

Installation Service

Trained crews of installation men are located in all industrial centers. If purchaser desires, we will install at moderate charge.

Estimates and Additional Information

The benefits of our experience gained during many years in shading all types of windows—steel, wood, hollow metal, etc.—in industrial institutions throughout the United States and Canada are at your disposal. Upon receipt of sketches, blue prints, or specifications of requirements, we will cheerfully give estimate on cost of installation.



A Typical Steel Sash Installation

Sun glare is eliminated without restricting ventilation. Note how center swung ventilator operates without interference from shade

MISSISSIPPI GLASS COMPANY

220 Fifth Avenue
NEW YORK, N. Y.

ST. LOUIS OFFICE
110 Ferry Street

CALIFORNIA OFFICE
Fullerton, Calif.

CHICAGO OFFICE
201 North Wells Street

MISSISSIPPI GLASS

A Standard for Every Architectural and Engineering Daylighting Requirement



Identification Label on Mississippi Glass

Special patterns for skylights and sidewall sash to afford uniform and efficient distribution of daylight illumination.

Also Special Glass for reduction of infrared (heat) transmission without sacrificing light.



Identification Label on Mississippi Wire Glass

List of Products

Polished Figured Glass

Polished Apex
Polished Artex
Polished Aurora
Polished Prestlite
Polished Syenite
◆
Colored Cathedral
◆
Coolite (Heat Absorbing)
◆
Vita Glass (Ultra-violet Transmitting)
Clear
Polished
Rough
Rough Wire Glass

Plain Figured Glass

Artex
Aurora
Dewlite
Factrolite
Florentine
Hammered
Hylite
Luxlite
Magnalite-A
Magnalite-B
Maze
Pentecor
Ribbed
Silverlite
Solite
Syenite
Translite

Wire Glass

Factrolite Wire Glass
Hammered Wire Glass
Hylite Wire Glass
Luxlite Wire Glass
Magnalite-A Wire Glass
Maze Wire Glass
Pentecor Wire Glass
Polished Wire Glass
Ribbed Wire Glass
Solite Wire Glass
Syenite Wire Glass
◆
Misco Wire Glass Polished
◆
Polished Protex
Ribbed Protex (3/8 in. only)

Samples and Literature

Samples and copy of catalogue and architects' file sheets should be on file in every architect's and engineer's office. If yours have been mislaid, please advise us.

Service

Our Research Department is equipped to furnish special information on problems which may be difficult for you to solve, covering such subjects as light transmission and distribution, heat transmission and absorption, transverse strength (wind pressure) thicknesses, sizes and weights of glass.

Do not hesitate to let us assist you on any glass problem you may have.

CALBAR PAINT & VARNISH COMPANY

Manufacturers of Technical Paints, Caulking and Glazing Compounds

FACTORY AND EXECUTIVE OFFICE

2620 North Martha Street, PHILADELPHIA, PA.

Products

CALBAR CAULK-O-SEAL NON-STAINING CAULKING and GLAZING COMPOUND.

METAL PRESERVATIVE PAINTS for all conditions, special Coatings resistant to gases, heat, fumes, etc.

ICE ENAMEL for refrigerating and cold storage warehouses for use over corkboard and asphalt mastic surfaces.

DAMPPOOFER, PLASTER BOND, WATERPROOFER.

NO. 1 BLACK BITUMINOUS ENAMEL, MAINTENANCE PAINT, MILL WHITE, SEALER and PRIMER, ALUMINUM PAINTS, PIPE SEAL JOINT COMPOUND, SPECIAL PAINTS, LACQUERS, ENAMELS, FILLERS.

Calbar Caulk-O-Seal Non-staining Caulking and Glazing Compound

A permanently plastic compound for sealing cracks around doors and windows, embedding and glazing glass, etc., under various conditions. Adheres tenaciously to masonry, metal, glass, wood, tile, providing an elastic, weatherproof, waterproof and lasting joint.

White, gray, natural, green, red, maroon, limestone, black. Special colors made to order in any amount.

A truly stainless, non-exudent compound which allows for contraction and expansion.

Vibration has no effect on it.

Can be painted over in a few hours and will not bleed.

Dries with a tough surface hide and remains pliable underneath.

Made in two consistencies:

Gun grade—for use with caulking gun.

Knife grade (putty consistency)—for use with caulking tool.

Caulk-O-Seal (Gun Grade) Application—To be applied with a light hand-operated, powerful gun supplied by us which forces the compound to the proper depth in a crack. Extremely high pressure is not required as Caulk-O-Seal is of the proper consistency.

The liquid portion is its life, therefore the larger the special oil content, consistent with workability, the longer its life.

Caulk-O-Seal is carefully compounded with a large percentage of vehicle "sealed in" by a special process and when applied as recommended by us will give satisfactory service for at least five years.

One gallon will caulk about 150 lineal feet with average opening $\frac{1}{4}$ inch wide and $\frac{1}{2}$ inch deep.

Caulk-O-Seal (Knife Grade) Application—Applied with a putty knife or special caulking tool and is easily worked.

Some Uses for Caulk-O-Seal—Window frames, door frames, porch enclosures, glazing wood or metal sash, setting metal sash, flashings, copings, setting tile, pointing masonry joints, skylights, greenhouses, heaters and boilers, baseboards, plaster cracks, dampproofing, waterproofing, expansion joints in tile or cement.

Calbar Ice Enamel

A brilliant white, high gloss enamel especially made for finishing corkboard and asphalt mastic surfaces in refrigeration and cold storage warehouse insulation. Two coats of Ice Enamel applied directly to the asphalt surface by brushing or spraying will result in a porcelainlike finish, preventing the asphalt from bleeding through.

Can be used where meats, ice cream and other food products are actually present and will not contaminate.

Two coats will hide a black surface perfectly. Also recommended for painting over surface stained with tar, asphalt, oil or creosote to prevent bleeding. One gallon will finish approximately 150 sq. ft., two coats.



Reg. U. S. Pat. Off.

Metal Preservative Paints

Made in various colors both as primer and finishing coats. For structural steel, gasholders, water standpipes, tanks, bridges, etc. Manufactured to meet special conditions, such as gas, heat, fume resistant, etc.

Dampproofer, Plaster Bond, Waterproof

For waterproofing foundation walls. Also for dampproofing interior surfaces of masonry walls. Plaster bond for masonry walls that are to be plastered.

No. 1 Black Bituminous Enamel

A real preservative for metal that dries quickly, forming an elastic, tough high gloss finish. Used for protection against gases, fumes, moisture, brine, acids, smoke and heat. Is also oilproof. Recommended for coating tanks, smokestacks, structural steel, metal buildings, breechings, boiler fronts, pipes, steel sash, condenser towers, ventilating fans and ducts, brine tanks, etc.

Brushes easily and covers 350 to 400 sq. ft. on a smooth surface.

Calbar Maintenance Paint

A special combination of pigments and oils for factory exterior painting. Made in various colors and standard plant colors can be matched.

Calbar Mill White

Made in flat, semi-gloss and full gloss ready to use. Also furnished in paste form with instructions for thinning to get the finish desired.

An intense brilliant white having a most unusual hiding capacity. Most work can be satisfactorily done with one coat.

Calbar Mill White is made from highly concentrated white pigments ground in tough and elastic non-yellowing oils. Produced to meet requirements for interior painting for withstanding moisture, steam, varying temperatures. Recommended for most any interior surface, such as wood, brick, metal, concrete and plaster. Can be washed repeatedly if desired. Also tinted in colors in gloss for dado enamel for painting lower inside walls.

Calbar Sealer and Primer

It is extremely important that certain surfaces not previously painted should be properly prepared before proceeding with the finishing coats.

Plaster, brick, cement, concrete, wall board and other porous surfaces should be sealed, not only to provide a firm foundation but to prevent lime spots from burning through and neutralize alkali conditions.

Calbar Aluminum Paints

Supplied in ready-to-use form or aluminum powder and vehicle separately. Various vehicles available for painting specific surfaces, such as tanks, bridges and other exterior structures or interior factory walls. Also special high temperature vehicle, wood primer, metal parts, machinery, etc.

Calbar Pipe Seal Joint Compound

For joints on water, gas, steam, air, oil, ammonia, and chemical lines. Does not get hard but makes a perfectly tight joint which can be taken apart any time. Recommended and is satisfactory for brass pipe.

Special Paints, Enamels, Fillers, etc.

A special technical service is offered in connection with requirements for paint, lacquer, enamel, fillers, coatings, etc., for use on machinery, castings and other products which are painted before leaving the plant. We solicit inquiries, and with our long experience in such work feel we can be of benefit to you.

CRAFTEX COMPANY

Manufacturers of Sunflex, Crafttex (the original plastic paint), Shadowall, Craftcoat, Crafttexsize and Allied Materials

BOSTON, MASS.

BRANCH OFFICES: NEW YORK AND CHICAGO

INTERIOR FLAT PAINT IN PASTE FORM

Description

Sunflex is an inside flat paint developed to combine in one product the desirable features of successful application to green concrete and similar damp surfaces, great hiding power and coverage, ease and speed of application, freedom from paint odor—all at low cost.

Sunflex is a time tested product meeting great success on work involving unusual conditions of application, service or cost. It makes a permanent, good looking paint job.

The following detailed description indicates the characteristics which have put Sunflex into a steadily growing number of industrial plants.

Two Types

There are two types of Sunflex. One type which is called simply Sunflex is for use where immediate washability is a factor of major importance. The other type called Industrial Sunflex is for use where washability is secondary to light reflection. Both types have the same general characteristics described in the following paragraphs. Industrial Sunflex has light reflection value of over 90 per cent, combined with permanent, non-yellowing whiteness. The light reflection value of Sunflex is 85 per cent.

Permanence

Sunflex makes a permanent bond with any solid surface to which it is applied. Heat, moisture, steam, acid fumes and other service factors that rapidly deteriorate most paints have little if any effect on Sunflex. Laundries, plants housing chemical processes and other buildings where such conditions are present are using Sunflex in large quantities.

Over Acoustical Materials

Sunflex is an ideal paint for acoustical materials.

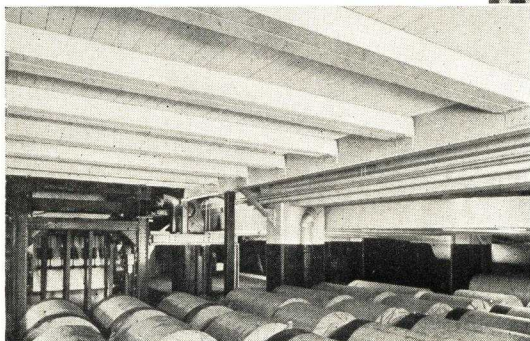
One-coat Coverage

The great hiding power of Sunflex saves a coat of paint on most work. Sunflex will do the ordinary three-coat job with two coats and the two-coat job with a single application, hiding wood, concrete, metal and other surfaces with a durable unifying coat of opaque white. Probably 75% of all Sunflex used goes into one-coat work. The savings in material and labor that follow the elimination of one coat of paint are a worthwhile consideration when cost is a factor.

A One Coat Sunflex Job

Right: Close up of metal air ducts and wood ceiling construction in St. Louis Globe-Democrat Bldg. before painting with Sunflex

Below: After painting with one coat of Sunflex



SUNFLEX

A CRAFTTEX PRODUCT



Pleasant Odor—Quick Drying

Sunflex dries dust free in an hour with none of the disagreeable odor associated with paint. This makes Sunflex ideal for use in plants manufacturing food and other products liable to contamination from paint odors, and hotels, stores, factories and other interiors where rapid repainting with minimum annoyance to occupants is desirable.

Application Over Green Concrete

Sunflex has the unusual characteristics of allowing damp surfaces to "breathe" and moisture to dry through without affecting the bond or appearance of the paint. Concrete can be painted with a permanent coat of Sunflex soon after the forms are removed.

Thus in new buildings, Sunflex makes it possible to finish the interior at once and turn the building over ready for immediate use and occupancy—an important advantage. It also eliminates the costly interruptions to production which are necessary when an interior is painted while a plant is operating. Fresh plaster and other damp surfaces which will eventually dry out can be similarly painted with Sunflex.

Low Cost

There is practically no step in a painting job where Sunflex does not effect a substantial saving. It can be brushed or sprayed, flows easily, has great coverage, is rapidly applied and dries without laps or brush marks. It need not be removed before repainting, and does not flake, chip or peel off.

Containers and Use

Sunflex is a white paste packed in 1, 5 and 10-gallon containers. It is prepared for use by adding water and stirring smooth to painting consistency.



Tinted Sunflex

Supplied in nine standard tints and five darker colors. CRAFTTEX COMPANY will co-operate in making special colors of tinted Sunflex when 50 gallons or more are needed. Send us samples of desired tint.

Years of Successful Use

Sunflex was first put on the market in 1926. Early in 1928, all but the first floor of the Glenn Holmes Garage, Chicago, Ill., was painted with Sunflex. Within three years the first floor had to be repainted. Sunflex was used for repainting, because the Sunflex in the rest of the building was in perfect condition. Steadily increasing sales and use in such buildings as the following further testify to the standing of Sunflex:

Bakery—Colonial Bakery, Des Moines, Iowa
Dairy—Telling Belle Vernon Co., Cleveland, Ohio
Dye Works—Lanett Bleachery & Dye Works, Lanett, Ala.
Packers—California Packing Co. (Del Monte Fruits), Sleepy Eye, Minn.; Swift & Co.
Food Plant—Morton Salt Co., Chicago, Ill.
Silk Mill—Phoenix Silk Mfg. Co., Pottsville, Pa.
Laundries—Brawley Steam Laundry, Brawley, Calif.; Anderson's Laundry, St. Louis, Mo.
Paper Plant—Central Ohio Paper Co., Columbus, Ohio
Public Utility—Western Electric Company, Chicago, Ill.
Public Buildings—Starrett-Lehigh Building, New York, N. Y.; Skating Rink, Casino, Rye Beach, N. Y.; Carew Towers, Cincinnati, Ohio
Rubber Plants—La Crosse Rubber Mill, La Crosse, Wis.; B. F. Goodrich Rubber Co., Akron, Ohio
Manufacturing Plants—Technicolor Motion Picture Corp., Boston, Mass.; Honeywell Heat Regulator Co., Minneapolis, Minn.; Wadsworth Core & Machinery Co., Akron, Ohio; Triner Scale Co., Chicago, Ill.; American Can Co., Portland, Me., and Newark, N. J.; Lever Bros., Cambridge, Mass.; Radio Corporation of America, Roxbury, Mass.; Johnson & Johnson, New Brunswick, N. J.

U. S. Government Approval

Sunflex meets the requirements of specifications set by the Bureau of Standards for washable cold water paint and is being used on many government jobs.

THE EAGLE-PICHER LEAD COMPANY

Manufacturers of Lead Pigments for Paints

GENERAL OFFICES

Temple Bar Building, CINCINNATI, OHIO

For our Catalogue on High Temperature Insulating Materials, see Manufacturers' Index

Eagle Sublimed Blue Lead—for Metal Surfaces

Sublimed Blue Lead is a fine, slate-gray powder, produced by sublimating galena ore (lead sulphide) in special furnaces. The pigment is accurately mixed with linseed oil in proper proportions and ground. No other raw materials are used. Sublimed Blue Lead is not only highly efficient for rustproofing, but is also economical, both in original cost and long service.

A gallon of Sublimed Blue Lead will cover six hundred to eight hundred square feet of metal of average smoothness.

Advantages of Sublimed Blue Lead—

- Proper basicity, chemically stops corrosion.
- Exceptional durability; does not crack, check or peel.
- Elasticity and toughness in oil.
- Extreme fineness and smoothness.
- Easy brushing, spraying, and dipping qualities, air dried or baked.
- Remarkable opacity.
- Pleasing color—being slate gray and easily tinted.
- Exceptionally low cost per square foot.
- Can be used with neutral treated oils and varnishes.
- Suitable for use on wood or metal—all coats.

Estimating Paint Requirements on Structural Steel

The scale below represents a method employed by an important steel fabricator for rapidly estimating the approximate paint requirements of large projects. Based upon the use of Sublimed Blue Lead, which as a priming coat covers from six hundred to eight hundred square feet per gallon, this chart expresses the gallons of paint required per ton of steel in various types and shapes:

Average Highway Bridges	0.4 gal. per ton
Highway Beam Spans and Lattice Railing	0.8 gal. per ton
Light Mill Building	0.4 gal. per ton
Heavy Mill Building	0.32 gal. per ton
Plate Girders, Railway or Highway	0.24 gal. per ton
Heavy Highway and Railway Truss Spans	0.32 gal. per ton
Office Buildings	0.2 gal. per ton
Railing Beam Bridges	0.2 gal. per ton

For estimating graphite or iron oxide paint requirements, add 25% more paint to the scale above. For estimating red lead requirements, add 50% more paint to the scale.

How to Use Sublimed Blue Lead—The removal of rust, mill scale and dirt should be done generally by sand blasting or through the use of metal brushes, scrapers, chisels, hammers or other effective means until bright steel is exposed. If sand blasting is used, the first coat of paint must follow immediately.

Oil and grease may be removed by the use of naphtha or benzene. Do not apply paint on wet or damp surfaces and in no case until preceding coat is dry and hard. Allow about four days before applying second coat for exterior work. For interior work allow one week before applying a second coat, and approximately forty-eight hours between second and third coats.

Paint shall be evenly spread and shall be thoroughly brushed out. Where solder fluids have been used on metal surfaces, it shall be cleaned thoroughly with benzene before any paint is applied. All rivet heads and bolts, and all edges and corners

shall be thoroughly covered with paint in painting structural steel or other metal work.

How to Secure Sublimed Blue Lead—Sublimed Blue Lead in Oil sells at the same low price as Eagle White Lead in Oil and may be had in 12½, 25, 50 and 100-lb. containers, or may be secured from paint manufacturers by specifying pure Eagle Sublimed Blue Lead mixed to paint consistency ready to apply.

Paint Formulæ

Sublimed Blue Lead in Oil (paste)—First Coat

Sublimed Blue Lead in Oil.....	100 lbs.
Raw Linseed Oil.....	2¾ gals.
Turpentine or paint and varnish manufacturers' 48° to 50° Naphtha.....	1¾ gals.
Drier (unadulterated and rosin free).....	1 qt.
Paint produced approximately 7¼ gals. weighing 17½ to 18½ lbs. per gal.	

Second Coat

Sublimed Blue Lead in Oil.....	100 lbs.
Raw Linseed Oil.....	3 gals.
Turpentine or 48° to 50° Naphtha.....	2 qts.
Drier (unadulterated and rosin free).....	1 qt.
Paint produced approximately 6¾ gals. weighing 18½ to 19½ lbs. per gal.	

Sublimed Blue Lead—Dry (powder)—First Coat

Sublimed Blue Lead—Dry.....	90 lbs.
Raw Linseed Oil.....	3¾ gals.
Turpentine or 48° to 50° Naphtha.....	2 qts.
Drier (unadulterated and rosin free).....	1 qt.
Paint produced approximately 7¼ gals. weighing 17½ to 18½ lbs. per gal.	

*Second Coat

Sublimed Blue Lead—Dry.....	90 lbs.
Raw Linseed Oil.....	4¼ gals.
Turpentine or 48° to 50° Naphtha.....	2 qts.
Drier (unadulterated and rosin free).....	1 qt.
Paint produced approximately 6¾ gals. weighing 18½ to 19½ lbs. per gal.	

*Where impractical to have two formulæ used on a job, this second coat formulæ is suitable for both first and second coats.

When Naphtha is used as a substitute for turpentine, the flash point must comply with the fire underwriters or local ordinance.

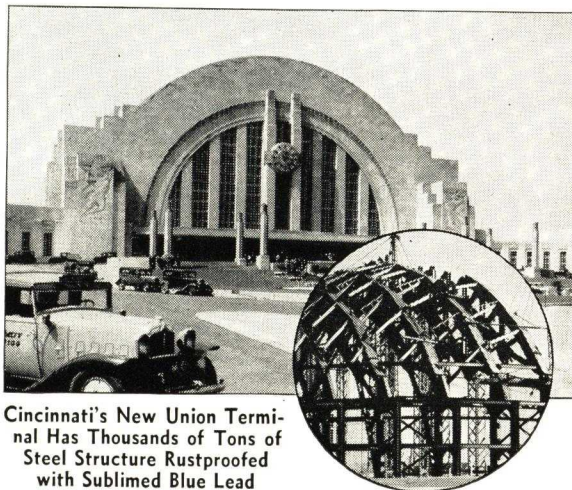
The Raw Linseed Oil shall conform to the linseed oil specifications of the A.S.T.M. Standards, Pages 655-658, Volume 21.

Note: For painting metal surfaces that may become too hot to warrant the use of linseed oil, substitute winter pressed fish oil.

Eagle Red Lead—Dry and in Oil

Eagle Red Lead in Oil is packed in 100, 50, 25, and 12½-lb. kegs. In dry form, it is put up in barrels of 500-600 lbs.

It possesses high "true" red lead content and is fine enough to insure splendid brushing qualities. It is impervious to water and unaffected by atmospheric gases. The rapid drying qualities of Eagle Red Lead make it decidedly advantageous for use where a hard surface, capable of withstanding abrasion, must be produced in a shorter time than usual.



Cincinnati's New Union Terminal Has Thousands of Tons of Steel Structure Rustproofed with Sublimed Blue Lead

NATIONAL LEAD COMPANY

Member of the Producers' Council, Inc.

Paint Materials for the Protection and Decoration of Wood, Plaster, Brick, Stone, Concrete, Stucco, Metal

NEW YORK, N. Y., 111 Broadway

BOSTON, MASS., National-Boston Lead Co., 800 Albany Street

BUFFALO, N. Y., 116 Oak Street

CHICAGO, ILL., 900 West 18th Street

CINCINNATI, OHIO, 659 Freeman Avenue

CLEVELAND, OHIO, 820 West Superior Avenue

PHILADELPHIA, PA., John T. Lewis & Bros. Co., Widener Building

PITTSBURGH, PA., National Lead & Oil Co., 316 Fourth Avenue

ST. LOUIS, MO., 722 Chestnut Street

SAN FRANCISCO, CAL., 2240 24th Street

Dutch Boy Products

Dutch Boy All Purpose Soft Paste White-Lead—This is a soft paste or quick-mixing white-lead which, as its name signifies, is equally suitable for inside or outside use. Mixed with flattening oil, it flats perfectly, giving a beautiful, washable interior finish free from "flashes" or shiny places. Mixed with linseed oil, it produces the fine type of durable exterior gloss finish always associated with pure white-lead. Moreover, it is whiter and smoother... thus making for whiter whites, clearer tints, better all-around appearance.

Dutch Boy White-Lead is also obtainable in the old-style heavy paste form, which differs in composition from the all-purpose soft paste only in that it contains no turpentine. Both are pure "lead-in-oil." It is the turpentine in the latter product, plus extra milling, that gives the quick-mixing qualities.

Dutch Boy Red-Lead-in-Oil—A very highly oxidized grade of pure red-lead ground in pure linseed oil to paste consistency. Its exceptionally high true red-lead (Pb_3O_4) content and the fineness of its pigment particles insure a paint of excellent brushing qualities, good coverage and extreme durability.

Dutch Boy Liquid Red-Lead—A ready-to-use, pure red-lead paint weighing 28 lbs. to the gallon. Equivalent to paint made by mixing 1.85 gals. linseed oil with 100 lbs. Dutch Boy Red-Lead-in-Oil (paste red-lead). Composition by weight: Pure red-lead (98% true red-lead)—81%; pure raw linseed oil—18%; pure liquid drier—1%. Can also be had tinted—in light and dark brown, light and dark green, and black.

Dutch Boy Wall Primer—Dutch Boy Wall Primer is a special primer developed for use in white-lead painting. Stops suction, seals fire cracks and, at same time, serves as first coat. Possesses exceptional hiding power. Forms a tightly adhering foundation for succeeding coats of white-lead. Works equally well on all interior surfaces—plaster, wallboard, insulating board, brick, concrete.

Dutch Boy Linseed Oil—Clear, carefully filtered, well settled, pure linseed oil conforming to specifications of American Society for Testing Materials. 1 and 5-gal. sealed cans.

Dutch Boy Flattening Oil—A skilfully blended flattening liquid for use with white-lead to produce flat and semiflat paint for interior walls and woodwork. When white-lead is thinned with flattening oil a paint results which possesses many points of excellence. It has good hiding power. It levels itself nicely. It sets slowly, so that large areas can be worked without risk of laps. It is durable and washable.

Dutch Boy Colors-in-Oil—These can be depended upon to be oil colors of the very highest grade. They were developed especially for tinting white-lead or red-lead paint.

In consistency a smooth, buttery paste, Dutch Boy colors disperse into paint quickly without lumping or streaking. Strong in tinting power, they are economical and give clean, sharp tints. Absolutely true in color tone, too.

Dutch Boy Liquid Drier—This is a properly balanced paint drier possessing every desirable quality—uniformity, strength, excellence of ingredients.



clean before priming. From old woodwork which has been painted before, all loose paint, scale, dirt and dust shall be removed. Wash off with benzine or turpentine all parts where liquid paint remover has been used.

After the priming coat on new woodwork is applied, all knots and sappy streaks shall receive one coat of shellac varnish brushed out thin and all dents, cracks and other defects shall be filled with putty composed of white-lead and whiting.

(2) **Plaster**—Before applying any paint to plaster, either new or old, see that it is clean and smooth. Fill all cracks and holes with patching plaster. Where new plaster to be painted is not properly aged, it shall be treated before priming with a solution made by dissolving 2 lbs. of zinc sulphate in 1 gal. of water.

(3) **Brick and Stone**—New brickwork shall not be primed until dry. At least 2 or 3 days of dry weather shall precede painting. If any mortar has become loose or damaged, all such places shall be pointed with mortar before applying paint. After priming, correct small defects in the surface with putty.

(4) **Stucco and Concrete**—Stucco or concrete shall be allowed to stand and dry at least six months before paint is applied. If painted before this time, it shall be treated with a solution made by dissolving 2 lbs. of zinc sulphate in 1 gal. of water.

(5) **Metal Work**—Iron, steel and other metal work shall be cleaned thoroughly of all loose paint, dirt, oil, grease, rust, scale and other foreign matter before paint is applied.

The Paint and Its Application—(6) Designation of Paint to be Used—All woodwork, plaster, brick, stone, concrete and stucco which are to be painted, shall be painted with NATIONAL LEAD COMPANY'S Dutch Boy White-Lead, Dutch Boy Flattening Oil, Dutch Boy Wall Primer, Dutch Boy Linseed Oil, pure turpentine and Dutch Boy Liquid Drier mixed according to the formulas hereinafter designated for each kind of work. All metal shall be painted with NATIONAL LEAD COMPANY'S Dutch Boy Red-Lead-in-Oil, Dutch Boy Liquid Red-Lead or pure dry red-lead and Dutch Boy Linseed Oil mixed according to formulas hereinafter given for each specific purpose.

(7) **Tinting Materials**—In producing tints and shades, Dutch Boy Colors-in-Oil shall be used. If colors-in-oil are used in quantities large enough to affect the consistency of the paint, the quantities of thinners named in the formulas shall be increased in amount equal to one-half the weight of the tinting material.

(8) **Applying the Paint**—No exterior painting shall be done when rain or snow is falling, during fog, or until after dew or moisture which may be on the surface has completely disappeared. Painting done in winter weather shall only be done when the temperature is above 50° F. and when all surfaces are dry. All exterior work shall be allowed to dry at least 4 days before the next coat is applied and at least 2 days shall be allowed between coats on interior work.

General Painting Specifications

Following are general specifications for the painting of interior and exterior surfaces:

Preparation of Surface—(1) Woodwork—New woodwork shall be cut smooth with sandpaper where required and dusted

Formulas

All the white-lead formulas that follow are based on Dutch Boy All-Purpose Soft Paste White-Lead. If heavy paste white-lead is to be used, the same formulas apply except for slight changes in turpentine or flattening oil quantities as noted.

(9) **New Woodwork, Exterior**—Three coats of paint, mixed as follows, shall be applied:

	Priming Coat	Second Coat	Third Coat
Dutch Boy All-Purpose Soft Paste White-Lead	100 lbs.	100 lbs.	100 lbs.
Dutch Boy Linseed Oil	4 gals.	1½ gals.	3 gals.
*Pure Turpentine	1¾ gals.	1¾ gals.	.....
†Dutch Boy Liquid Drier	1 pt.	1 pt.	1 pt.

*With heavy paste white-lead, add 1 qt. turpentine to third coat formula and increase by this quantity the turpentine in other two coats.

†When boiled oil is used, reduce drier to ½ pt.

(10) **Repainting Woodwork, Exterior**—Two coats of paint, mixed as follows, shall be applied:

	First Coat	Second Coat
Dutch Boy All-Purpose Soft Paste White-Lead	100 lbs.	100 lbs.
Dutch Boy Linseed Oil	2 gals.	3 gals.
*Pure Turpentine	1¾ gals.	.....
†Dutch Boy Liquid Drier	1 pt.	1 pt.

*With heavy paste white-lead, add 1 qt. turpentine to second coat formula and increase by this quantity the turpentine in first coat.

†When boiled oil is used, reduce drier to ½ pt.

(11) **Plaster, Interior**—Plaster never before painted shall first receive a priming coat of Dutch Boy Wall Primer and then two coats mixed as follows:

	Second Coat	Third Coat Flat Finish	Third Coat Eggshell Finish
Dutch Boy All-Purpose Soft Paste White-Lead	100 lbs.	100 lbs.	100 lbs.
*Dutch Boy Flatting Oil	1¾ gals.	1¾ gals.	1¾ gals.
Dutch Boy Wall Primer	2 gals.	.....	8 gals.

*With heavy paste white-lead, increase flatting oil to 2 gals. in each case.

In repainting plaster, only two coats are necessary and the priming coat may be omitted.

(12) **New Woodwork, Interior**—Woodwork inside never before painted shall first receive a priming coat as follows:

	Priming Coat
Dutch Boy All-Purpose Soft Paste White-Lead	100 lbs.
Dutch Boy Linseed Oil	3 gals.
*Dutch Boy Flatting Oil	2¾ gals.
Dutch Boy Liquid Drier	1 pt.

*With heavy paste white-lead, increase to 3 gals.

This priming coat shall be followed by two coats mixed as follows:

	Second Coat	Third Coat Flat Finish	Third Coat Eggshell Finish
Dutch Boy All-Purpose Soft Paste White-Lead	100 lbs.	100 lbs.	100 lbs.
*Dutch Boy Flatting Oil	1¾ gals.	1¾ gals.	1¾ gals.
Dutch Boy Wall Primer	2 gals.	.....	8 gals.

*With heavy paste white-lead, increase to 2 gals. in each case.

(13) **Repainting Woodwork, Interior**—In repainting interior woodwork, only two coats are necessary. Use the same formulas as for New Woodwork, Inside, simply omitting the priming coat.

(14) **Brick, Stucco, Concrete, Stone**—Three coats of paint, mixed as follows, shall be applied to brick, stucco, concrete and stone never before painted.

	Priming Coat	Second Coat
Dutch Boy All-Purpose Soft Paste White-Lead	100 lbs.	100 lbs.
Dutch Boy Linseed Oil	3 gals.**	2 gals.
Spar Varnish	2 gals.	.....
*Pure Turpentine	1¾ gals.	1¾ gals.
†Dutch Boy Liquid Drier	.....	1 pt.

	Third Coat Gloss Finish	Third Coat Flat Finish
Dutch Boy All-Purpose Soft Paste White-Lead	100 lbs.	100 lbs.
Dutch Boy Linseed Oil	3 gals.	.....
Dutch Boy Flatting Oil	.....	1¾ gals.
*Pure Turpentine	.....	.....
†Dutch Boy Liquid Drier	1 pt.	.....

*With heavy paste white-lead, increase turpentine in priming and second coats to 1½ gals., add 1 qt. turpentine to third coat gloss formula, and increase flatting oil in flat finish formula to 2 gals.

†When boiled oil is used, reduce drier to ½ pt.

**Boiled oil is preferable here. If it is not available, use raw linseed oil and add 1½ pts. drier.

(15) **Metal Work, Exterior and Interior**—Three coats of paint, mixed as follows, shall be applied to exterior and interior metal work:

	First Coat	Second Coat (light brown)
Dutch Boy Paste Red-Lead	100 lbs.	100 lbs.
*Dutch Boy Linseed Oil	2¾ gals.	2½ gals.
Dutch Boy Lampblack	.....	¾ pt.
Pure Turpentine	1 pt.	1 pt.
Dutch Boy Liquid Drier	1 pt.	1 pt.

or

Pure Dry Red-Lead	100 lbs.	100 lbs.
*Dutch Boy Linseed Oil	3¾ gals.	3¾ gals.
Dutch Boy Lampblack	.....	¾ pt.
Pure Turpentine	1 pt.	1 pt.
Dutch Boy Liquid Drier	1 pt.	1 pt.

Third Coat (dark brown)

Dutch Boy Paste Red-Lead	100 lbs.
*Dutch Boy Linseed Oil	3¾ gals.
Dutch Boy Lampblack	6 pts.
Pure Turpentine	1 pt.
Dutch Boy Liquid Drier	1 pt.

or

Pure Dry Red-Lead	100 lbs.
*Dutch Boy Linseed Oil	5 gals.
Dutch Boy Lampblack	6½ pts.
Pure Turpentine	1 pt.
Dutch Boy Liquid Drier	1 pt.

*If genuine boiled linseed oil is available, use one-third boiled and two-thirds raw oil, omitting drier.

If liquid red-lead is to be used, specify Dutch Boy Liquid Red-Lead No. 1 (natural red-lead color) for first coat, Dutch Boy Liquid Red-Lead No. 6 (light brown) for second coat and Dutch Boy Liquid Red-Lead No. 7 (dark brown) for third coat.

Where a dark color other than brown is desired for the finishing coat, one of the following formulas shall be used according to the color desired:

	Light Green	Dark Green
Dutch Boy Paste Red-Lead	100 lbs.	100 lbs.
*Dutch Boy Linseed Oil	5½ gals.	4 gals.
Dutch Boy Medium Chrome Yellow	1½ gals.	5 pts.
Dutch Boy Chinese or Prussian Blue	1¾ gals.	6 pts.
Pure Turpentine	1 pt.	1 qt.
Dutch Boy Liquid Drier	1 pt.	1 qt.

	Black
Dutch Boy Paste Red-Lead	100 lbs.
*Dutch Boy Linseed Oil	14 gals.
Dutch Boy Chinese or Prussian Blue	1½ gals.
Dutch Boy Lampblack	6½ gals.
Pure Turpentine	½ gal.
Dutch Boy Liquid Drier	½ gal.

*If genuine boiled linseed oil is available, use one-third boiled and two-thirds raw oil, omitting drier.

If liquid red-lead is to be used, specify Dutch Boy Liquid Red-Lead according to the finishing color desired, that is: No. 8—light green; No. 9—dark green; or No. 5—black.

Formulas for Other Work

If the type of painting work to be done is not covered here, we shall be glad to furnish the proper formulas for it if you will address a request to NATIONAL LEAD COMPANY, 111 Broadway, New York, N. Y.

Booklets on Painting

A practical book, of unusual value to those interested in the subjects of paint and painting, is our "Handbook on Painting." This book gives formulas and directions for exterior and interior work of all kinds. It covers, in complete detail, the painting of wood, plaster, brick, stone, concrete, stucco and metal. We also publish a booklet, "Structural Metal Painting," which discusses the causes of corrosion and remedies for it, besides giving formulas and going into detail on the subject of painting structural metal of all kinds. For copies, simply address our nearest branch.

THOMPSON & COMPANY

Manufacturers of Industrial and Technical Paints

P. O. Box 557 N.S., PITTSBURGH, PA.

Products

PROTEXCIDE NON-CORROSIVE PAINTS.

DAYLIGHT MILL WHITE PAINTS.

THOMPSON'S ALUMINUM PAINTS and VEHICLES.

Also Cementite Primer; Waterseal Damp-proofing Paints; Diamond Paints for Cement and Wood; Dado Paints; Acidproof Paints; Industrial and Maintenance Paints.



TRADE-MARK
(Registered)

Over 86 Years of Service with Quality

The record and history of THOMPSON & COMPANY began in 1847 and has been one of continuous reliability in contracts and recognized dependability for quality of its products. The same rugged principles of the founders are carried on today:

Every product can be relied upon to be exactly as represented.

Protexcide Non-corrosive Paints

PROTEXCIDE
Tri Chrome Paint

Made along engineering lines. Used for protecting iron and steel against corrosion. Resistant to moisture and injurious gases.

The Vehicle—The linseed oil selected for Protexcide Paints is heated and combined with china wood oil and varnish gums to overcome the voids which exist in single vehicle paints.

The Pigments—The pigments selected reduce polar activity to a minimum and are so proportioned as to form a proper mixture of coarse, fine, minute, fibrous and crystalline particles to insure an even, enduring film, and are basic by nature to reduce electrolytic action.

Greater Covering Capacity—Greater covering capacity is obtained from Protexcide Paints because the body is strong, dense, and easily applied; they cover from 500 to 600 sq. ft. to the gal. or (for heavy construction) about 3½ to 4 tons of steel to the gal.

Colors—Eight standard colors:

Red Lead No. 330
Blue Lead No. 335
Elastic Red No. 333

Gray No. 336
Olive Green No. 337

Elastic Brown No. 334
Black Graphite No. 332
Carbon Black No. 331

THOMPSON'S ALUMINUM PAINTS

Note: We use exclusively in our Alumbrite and Aluminum Paints, Alcoa Albron Powder made by the Aluminum Company of America.

Alumbrite

(Pronounced Aloombrite)

An extremely high quality aluminum paint sold in double compartment cans. The powder furnished is Alcoa Albron Aluminum Powder, of a grade much finer in particle size than the ordinary varnish grade, and the vehicle is Thompson's SO-75 Diamond Wood Priming Aluminum Vehicle. This combination gives a finer, brighter, smoother aluminum paint than obtained from the usual aluminum paints on the market.

An All-purpose Paint—Alumbrite, due to its extreme elasticity and particular formulation may be used on wood, metal, interiors or exteriors. It is packed in ¼, 1 and 5 gal. double compartment cans. The powder compartment contains sufficient powder so that when mixed with the vehicle in the large compartment, the full U. S. liquid measure of the size sold will be obtained.

Alumbrite sets up in 3 to 4 hours and is dry enough for second coating in 24 hours. It spreads 600 to 700 sq. ft. per gal.

Will Keep Indefinitely—Alumbrite in its handy packages is the proper material to keep in stock for the small jobs of aluminum painting for which you desire to keep a supply of paint on hand.

Advantages of Freshly Mixed Aluminum Paint—Polished Aluminum Powder, which is the type used for making Aluminum Paint, is aided in its leafing qualities by the stearic acid of which the polish is composed, as well as by the leafing qualities of the vehicle. This polish is soluble on standing in all aluminum vehicles yet known. When it is dissolved, you have unpolished powder which has a dull gray color instead of the brilliant silvery color and the leafing of the metal to the surface is greatly impaired. This difference is not noticeable over a period of two or three weeks, but when aluminum paint, ready mixed, stands for longer than that, quite a noticeable difference in sheen and color can be observed on comparison with freshly mixed paint.

Alum-in-Oil

Thompson's Alum-in-Oil Vehicle passes the specifications approved by Aluminum Company of America and used by many of the largest industrial concerns and municipalities for the protection of tanks, bridges, and all exterior metal surfaces. (It also gives perfect service for inside use.)

Daylight Mill White Paints



Full-bodied standard light-distributing paints—non-yellowing and non-porous. At a moderate cost they offer the highest grade of interior white finishing, both as to light reflecting range and permanence of luminous brightness. They are prepared from treated vegetable oils, hardened fossil gums and pigments of great light refractivity to produce the following results:

- (1) Proper radiation and diffusion of light.
- (2) Adhesion to any interior surface—brick, cement, plaster, wood, wall board or metal, withstanding vibration and temperature changes without chipping or scaling.
- (3) Evenness of film—preventing accumulation of dust.

Greater Hiding Power—Because of their opacity, Daylight Mill White Paints require less labor and spread farther. Covering capacity one coat: by brushing, 400 to 500 sq. ft. to the gal.; by spraying, 200 to 250 sq. ft. to the gal.

Three Finishes—High gloss, eggshell gloss and flat.

Aluminum Vehicles

The following vehicles which are used in Thompson's Ready-Mixed Aluminum Paints (not here described) may be purchased separately for mixing with Alcoa Albron Aluminum Powder in the proportions indicated on the containers.

No. 167 Flexoperm Aluminum Vehicle—A heat treated, linseed-china wood oil varnish which has a very impervious film and an extremely high resistance to acids or fumes. Packed in 1, 5, 30 and 55-gal. containers.

No. 441 Exterior Long Oil Alum-in-Oil Vehicle—The varnish for this vehicle is a high grade long oil, water-resisting spar varnish, clear and free from suspended matter and does not thicken in the container. When mixed with aluminum bronze powder—2 lbs. of powder per gallon of varnish, the powder forms a brilliant continuous metallic layer on the surface of the liquid immediately after stirring is discontinued. The paint shows satisfactory spreading and covering qualities and does not break or sag when applied to a smooth vertical surface. This vehicle has remarkable leaf retention qualities resulting in a paint that retains its brilliance and gloss much longer than is possible with ordinary vehicles. It sets to touch in 2 to 6 hours and dries hard in 24.

Packed in 1, 5, 30 and 55-gal. containers.
No. 442 Interior Alum-in-Oil Vehicle—A spar varnish designed to give excellent leafing, covering and wearing. Will hold the paint tight to all types of interior building surfaces withstanding all vibration. Dries to a harder surface than exterior vehicle.

No. SO-599 Eclipse Aluminum Vehicle—A lower priced vehicle for interior use only in such places as warehouses, garages, etc.

No. SO-86 Diamond Heat Resisting Aluminum Vehicle—A very high grade synthetic resin varnish for use on hot surfaces up to 1000° F. such as furnace fronts, stacks, boilers, etc.

No. SO-54 Eclipse Heat Resisting Aluminum Vehicle—A lower priced vehicle for use where heat does not fluctuate greatly, and where temperatures do not exceed 400° to 500° F.

No. SO-75 Diamond Wood Priming Aluminum Vehicle—Provides a surface which has a good "tooth" for succeeding coats of paint to adhere to.

Other Thompson Aluminum Vehicles—No. 445 Eclipse Bronzing Liquid; No. SO-1 Heavy Body Bronzing Liquid; No. SO-83N Bakelite Aluminum Vehicle.

Note: Any of the above vehicles are furnished ready-mixed with proper proportions of Alcoa Albron Aluminum Powder the same day as shipped. Order by the above names.

THE TROPICAL PAINT & OIL CO.

Specialists in the Manufacture of Industrial Maintenance and Upkeep Paints

GENERAL OFFICES AND FACTORIES

1236-1280 West 70th Street, CLEVELAND, OHIO

BRANCH OFFICES AND WAREHOUSES IN PRINCIPAL CITIES

Products

A complete line of industrial maintenance and upkeep paints of which the following are typical:

Elastikote—Bakelite is used to reinforce Elastikote.

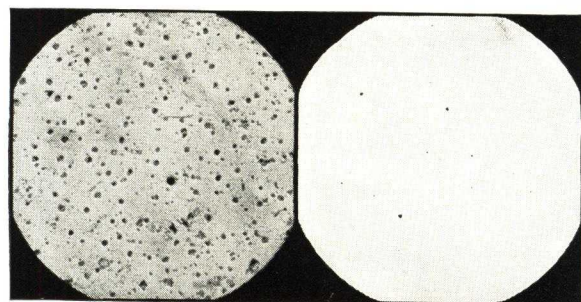
Elastikote is an exterior paint for use on industrial buildings where severe and unusual conditions are encountered. It spreads easily, covers well and is ideal for use on buildings in factory districts exposed to acid fumes, smoke, heat and the elements. Elastikote is a specially formulated paint containing ingredients not common to most paints which results in durability and long service, making the cost per year very low. It can be used on wood, brick, metal, canvas and roll roofing.

Roofkoter—Roofkoter is a heavy black, semi-liquid cement, which is reinforced with long fibre asbestos. It can be easily spread right over an old roof without removing the old covering. Roofkoter forms a waterproof sheet free from laps, seams and nail holes which will not crack, but expands and contracts with the changes in temperature.

Tocoseal—This is a soft, bulky paste made of the same ingredients as Roofkoter but of heavier consistency. It is used for patching roofs of all types, repairing flashings, parapet walls, etc.

Tropelite—A 100% Bakelite Coating in a clear amber color. Resists alkalis, alcohol, oil and grease and is unaffected by boiling water. Has great dielectric resistance.

Boiler Seal—This is a soft, bulky paste reinforced with long fibre asbestos to be trowelled on brick boiler settings to prevent infiltration of air.



Linseed Oil Film
Magnified 100 diameters

Tung Oil Film
Magnified 100 diameters

B & P Tung Oil Enamel—An extremely durable enamel (reinforced with Bakelite) in white and colors for interior walls and ceilings of plaster, concrete, brick,

TROPICAL

CUSTOM-MADE PAINTS FOR MAINTENANCE AND UPKEEP

TRADE-MARK REG. U. S. PAT. OFF.

wood or metal. B & P Tung Oil Enamel thoroughly protects the surface by resisting steam, heat, cold and dampness. It forms a dense, tile-like surface that can be washed repeatedly.

Floorkote—This paint is made for use on cement floors. It penetrates deep into the surface and binds the grains of the cement together, thus preventing "dusting." At the same time it builds up a beautiful finish on the surface. Dries in four hours.

Cementkote—Tropical Cementkote is for concrete, cement, stucco, brick and stone, exterior or interior walls and similar surfaces. It waterproofs the surface and colors it as well. Supplied in White and attractive colors.

Rhinamel—Rhinamel meets every requirement for a quick-drying, colorful and durable high gloss enamel suitable for every type of interior or exterior surface. Fifteen colors, Black and White. Dries in four hours.

Fume-Fite Enamel—Fume-Fite White Enamel is for interior walls and ceilings. It is designed to combat the destruction, disintegration, flattening and yellowing caused by fumes released by chemical processes in industry.

Duratite—Duratite is a semi-paste waterproof compound which is made especially for caulking and glazing. It clings tightly to wood, brick, stone, concrete, glass and steel, and is shot from a gun right into the cracks and crevices.

The Tropical Surface Saver

We maintain a staff of men covering the United States who are known as "Tropical Surface Savers." They have been trained in paints and painting problems and know how to analyze painting conditions.

The "Tropical Surface Saver" in your locality will be glad to give his recommendations for protecting your buildings and equipment. This is a service of which you can avail yourself free of charge.

Send for Catalog

A catalog describing the complete Tropical Line of Custom-Made Maintenance Paints sent on request.



The Tropical Surface Saver

(From a copyrighted advertisement in the Saturday Evening Post)

U. S. GUTTA PERCHA PAINT COMPANY

PROVIDENCE, R. I.

BRANCH OFFICES

NEW YORK, N. Y., 420 Lexington Avenue

CHICAGO, ILL., 659 Washington Boulevard

SAN FRANCISCO, CALIF., 301 Mission Street

DISTRIBUTORS IN ALL PRINCIPAL CITIES

Products

BARRELED SUNLIGHT FINISHING COATS—Gloss, Semi-Gloss, Extra Heavy Eggshell, Extra Heavy Flat, Chemic Enamel and Flat Wall Finish.

BARRELED SUNLIGHT PRIMING COATS—Undercoat, Granolith and Plaster Sealer.

Also manufacturers of Interior and Exterior Technical Paints for all purposes.



Interior Barreled Sunlight Specifications

General Recommendations—All surfaces must be free from material injurious to paint and properly prepared to produce satisfactory work. No painting should be done until buildings are enclosed and heated, except in dry summer weather. At all times rooms should be well ventilated to avoid condensation during application and drying.

For best results sufficient time should be allowed for plaster, concrete, cement and unseasoned lumber to become dry before painting. Seal all knots, sappy and resinous spots in wood with shellac and allow to dry. Rust, scale and grease must be thoroughly removed from all iron work. Remove calcimine before refinishing old walls and ceilings. A wash of Zinc Sulphate solution

(2 lbs. Zinc Sulphate Crystals per gallon of water) will assist in neutralizing excessive lime or alkaline conditions. Allow to dry thoroughly.

Contractor shall inspect all surfaces before starting work and make certain that these surfaces are in proper condition for painting. All plaster repairs should be sealed with the first coat mixture. After first or sealing coat is applied, walls and ceilings should again be inspected to make sure surfaces are sealed tight. If any cracks, streaks or suction spots show, they should be touched up with the first coat mixture. The same applies to all other porous surfaces such as cement, concrete, brick, composition boards, etc. Each coat should be properly mixed and properly applied for satisfactory results. Always allow each coat of paint to dry hard before application of each succeeding coat.

Never use Linseed Oil, Varnish or Drier as a thinner for finishing coats. Gloss and Semi-Gloss may be thinned slightly with Turpentine if necessary. Extra Heavy Flat and Extra Heavy Eggshell finishing coats are extremely heavy in body, and should be thinned liberally with Turpentine or Mineral Spirits until they flow out evenly, free from brush marks.

All materials shall be delivered in the original packages bearing the name and brand of the manufacturer.

Wood, Metal and Similar Surfaces—*First Coat*—Barreled Sunlight Undercoat—Thin if necessary to a proper application consistency with Turpentine or Mineral Spirits.

Second Coat—Barreled Sunlight Undercoat—Thin if necessary as above.

Third Coat—Barreled Sunlight—Gloss, Semi-Gloss, Extra Heavy Eggshell, or Extra Heavy Flat. (See "General Recommendations" for proper thinning.)

Concrete, Brick, Cement Plaster and Similar Porous Surfaces—*First Coat*—Barreled Sunlight Granolith—This coat should be reduced with Rice's No. 65 Reducing Oil, which acts as a "sealer" and "binder" to insure the uniform appearance of succeeding coats. As these surfaces vary widely in porosity, it is important (on 2-coat jobs, essential) that the First Coat be so mixed and applied as to thoroughly seal the surface. It is suggested that small test areas of different proportions of Granolith and No. 65 Reducing Oil be painted out, adopting the mixture which gives the best results.

Second Coat—Barreled Sunlight Granolith—Add 1 qt. of Rice's No. 65 Reducing Oil to each gallon and thin to proper application consistency with Turpentine or Mineral Spirits.

Third Coat—Barreled Sunlight—Gloss, Semi-Gloss, Extra Heavy Eggshell, or Extra Heavy Flat. (See "General Recommendations" for thinning.)

Hard or Smooth Finish Plaster—*First Coat*—Barreled Sunlight Plaster Sealer.

Second Coat—Barreled Sunlight Undercoat—Add at least 2 qts. Barreled Sunlight Plaster Sealer to each gallon and thin to the proper application consistency with Turpentine or Mineral Spirits.

Third Coat—Barreled Sunlight—Gloss, Semi-Gloss, Extra Heavy Eggshell, or Extra Heavy Flat. (See "General Recommendations" for reducing Gloss and Semi-Gloss.) When using Extra Heavy Flat or Extra Heavy Eggshell on above surfaces they should be thinned and applied as a flat wall paint.

Iron and Steel Work—Prime all iron and steel work with one coat of Rice's Red Oxide Anti-Corrosive Paint.

Two-Coat Work—Same specifications as for three-coat work, but omitting the intermediate coat.

Barreled Sunlight for Industrial Interiors

The gloss white idea for plant interior painting was introduced by Barreled Sunlight many years ago. Its ability to provide an intensely white finish, high in light reflection value, easy to keep clean and one that retains its whiteness for an unusually long time (see guarantee below) has led to its use in industrial plants of every description: textile mills, food plants, laundries, machine shops, etc.

Description—Barreled Sunlight is made by the exclusive "Rice Process" of manufacture, a process that not only eliminates those portions of oil which have a tendency to turn white paint yellow, but one that adds greatly to its durability. It also gives the remarkable hiding power and ease of flow which makes less paint and less labor necessary so that Barreled Sunlight costs no more on the finished job than many paints priced less per gallon. Furthermore, the smooth, non-porous finish of Barreled Sunlight resists dirt and can be repeatedly washed without injury to the surface.

Guarantee—Interior Barreled Sunlight, the Rice Process White, is guaranteed to remain white longer than any oil gloss paint or enamel, domestic or foreign, applied under the same conditions and according to our specifications. If it does not do so, we will give, free, enough Barreled Sunlight to repaint the job.

Finishes—For industrial interiors where the full gloss finish is not desired, we recommend Barreled Sunlight Extra Heavy Eggshell or Extra Heavy Flat—identical in characteristics to the Gloss except in degree of lustre.

Priming Coats—Barreled Sunlight Undercoat, Granolith and Plaster Sealer are especially prepared for properly sealing and binding various surfaces (see specifications) to provide the proper foundation for finishing coats.

Application and Tinting—Barreled Sunlight can be applied by the spray gun just as well as by brush. It also may be tinted on the job with oil colors or in quantity will be tinted at the factory without extra charge. Priming paints should be tinted to approximately the same shade as the finishing coats. Barreled Sunlight Dado colors will be tinted at the factory to suit individual requirements.

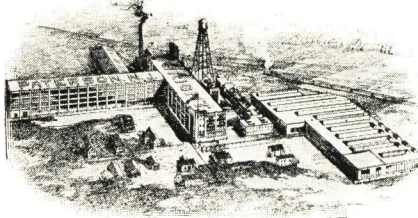
Barreled Sunlight Chemic Enamel

In oven rooms, bleacheries, laboratories, rubber plants, etc., wherever chemical fumes, excessive heat and other discoloring agents prevail, we recommend Barreled Sunlight Chemic Enamel. Its success in giving white paint protection under such adverse conditions lies in the development and use of a vehicle upon which these paint discoloring agents have little or no effect.

Specifications—Follow standard Interior Barreled Sunlight three-coat specifications, substituting Extra Heavy Flat for the intermediate coat.



Agfa Ansco Corporation, Binghamton, N. Y.



Wright Aeronautical Corp., Paterson, N. J.

{ These and many other nationally known plants are users of Barreled Sunlight. Additional references will be gladly furnished on request. }



Western Electric Co., Hawthorne Station, Chicago, Ill.

WAILES DOVE-HERMISTON CORPORATION

FORMERLY AMERICAN BITUMASTIC ENAMELS CO.

Manufacturers of Protective Paints and Coatings

17 So. Battery Place, NEW YORK, N. Y.

BRANCH OFFICES

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CLEVELAND, OHIO, Union Trust Building

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WORKS, WESTFIELD, N. J., AND EAST ST. LOUIS, ILL.

Products

We Specialize in the Protection of Underground and Underwater Surfaces.

"BITUMASTIC" and "HERMASTIC" SOLUTIONS, ENAMELS and PAINTS—Proven Protective Coatings for iron, steel and concrete exposed to extreme temperatures, atmospheric conditions, moisture, acid fumes, gases, alkalis, brine or other corrosive agencies.

Bitumastic Solution

A jet black bituminous paint that possesses exceptional preservative qualities. Applied like ordinary paint; dries quickly, forming a tough, elastic coating with high glossy finish. Used by many companies as the standard protection on equipment and in places where, because of extreme heat, excessive moisture or exposure to chemical and acid fumes, smoke, brine, etc., an exceptional paint is required.

It provides effective protection for:

Structural steel	Air washers	Breechings
Metal roofs and bldgs.	Cooling towers	Tanks
Ventilating fans	Smokestacks	Pipe
Ventilating ducts	Boiler fronts	Steel Sash
Other steel structures and equipment		

Furnished in 1 and 5-gal. cans, 30 and 50-gal. drums. Covers 350 to 400 sq. ft. per gal. on new steel. Moderately priced.

Bitumastic Paints in Colors

Made from a bituminous base, refined and colored, in dark red, tan, gray, and green, offer an efficient protective coating for use where a color is preferred.

Bitumastic Paints are recommended for structural steel, window sash, ventilators, skylights, tanks, pipes and other steel structures and equipment. While the colored paints are not as suitable for use under extreme heat as the black solution, they are fully resistant to acid fumes and vapors.

Furnished in 1 and 5-gal. cans, 30 and 50-gal. drums. Covering capacities, 350 sq. ft. per gal. on new steel.

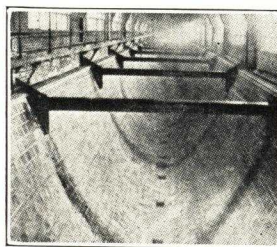
Bitumastic Enamel

A solid black coating compounded from a purified coal-tar base with the addition of suitable other materials chosen as the result of many years of experience. It is applied hot over a priming coat of Bitumastic Priming Solution, and hardens immediately. It is applied by hand-brushing to a thickness of about $\frac{1}{16}$ in. for the usual single coat on tanks and similar structures, by the sling or "rolling rig" method to a similar thickness on the outside of oil, gas and water pipe and by spinning methods to the inside of pipe to a thickness usually of about $\frac{3}{32}$ in. It provides permanent protection against water, soil acids, alkalis, brine, and most other corrosive agencies. It has been found in many cases to be in perfect condition after 30 years' exposure.

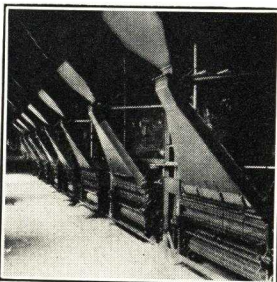
Many thousands of miles of buried gas and oil pipe are protected on the outside with Bitumastic Enamel. Because of its elimination of tuberculation and corrosion, its moderate cost, its tenacious bond to the metal and the reduction of friction to a minimum which results in smaller pipe sizes and lower costs, Bitumastic Enamel lining is of particular interest for water lines. Because of its resistance to most acids and alkalis, it is of great value also in sewer lines.

BITUMASTIC

HERMASTIC

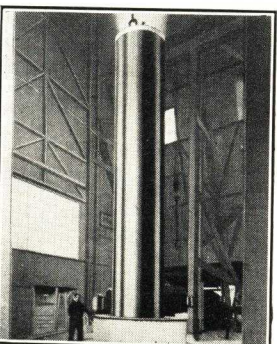


Steel Suspension Bunker Lined with Hermastic and Tile, Toledo, Ohio



Typical Boiler Room

Hot surfaces kept bright and shining with Bitumastic Solution



Coating 30-ft. Lengths of Steel Water Pipe

Pipe dipped into tank of Hermastic Pipe Dip at the mill

Bitumastic Enamel, applied by hand-brushing, is extensively used for the protection of the inside of water tanks and all sorts of steel structures exposed to underground, under-water or similar bad corrosive environments.

Hermastic Enamel

A coating of asphaltic base, similar to Bitumastic Enamel but possessing more elasticity and resistance to the effects of actinic light. Strongly adhesive and impervious to moisture, chemical fumes, alkalis, salt water, most acids and other corrosive agents. Used for lining tanks, coal bunkers, etc.

Outside of Water or Sewer Pipe

A very novel and extremely satisfactory method is used to apply reinforced cement mortar from $\frac{1}{2}$ to 1 in. in thickness to the outside of steel pipe, either to the bare pipe or over a coating of Bitumastic Enamel. This mortar coating is extraordinarily hard and dense—in effect a new kind of concrete—due to the use of high frequency vibrators located at strategic points in the machine. This hard concrete covering acts as a shield to protect the underlying coating from damage during transportation, handling and during construction. It will absolutely prevent any "soil stress" effects on the coating. It is to all intents and purposes waterproof and, therefore, an excellent protective coating in itself.

The Choice of Bitumastic and Hermastic Enamels

As between Bitumastic Enamel and Hermastic Enamel we recommend that Bitumastic be used whenever conditions permit on account of its proven record of almost unlimited life. If extremes of temperature are to be met or where considerable elasticity is required, we recommend Hermastic.

Application

We maintain a force of skilled men for the application of Bitumastic and Hermastic coatings under contract. Occasionally the coatings may be purchased and applied by the purchaser under circumstances which indicate that proper application will be made.

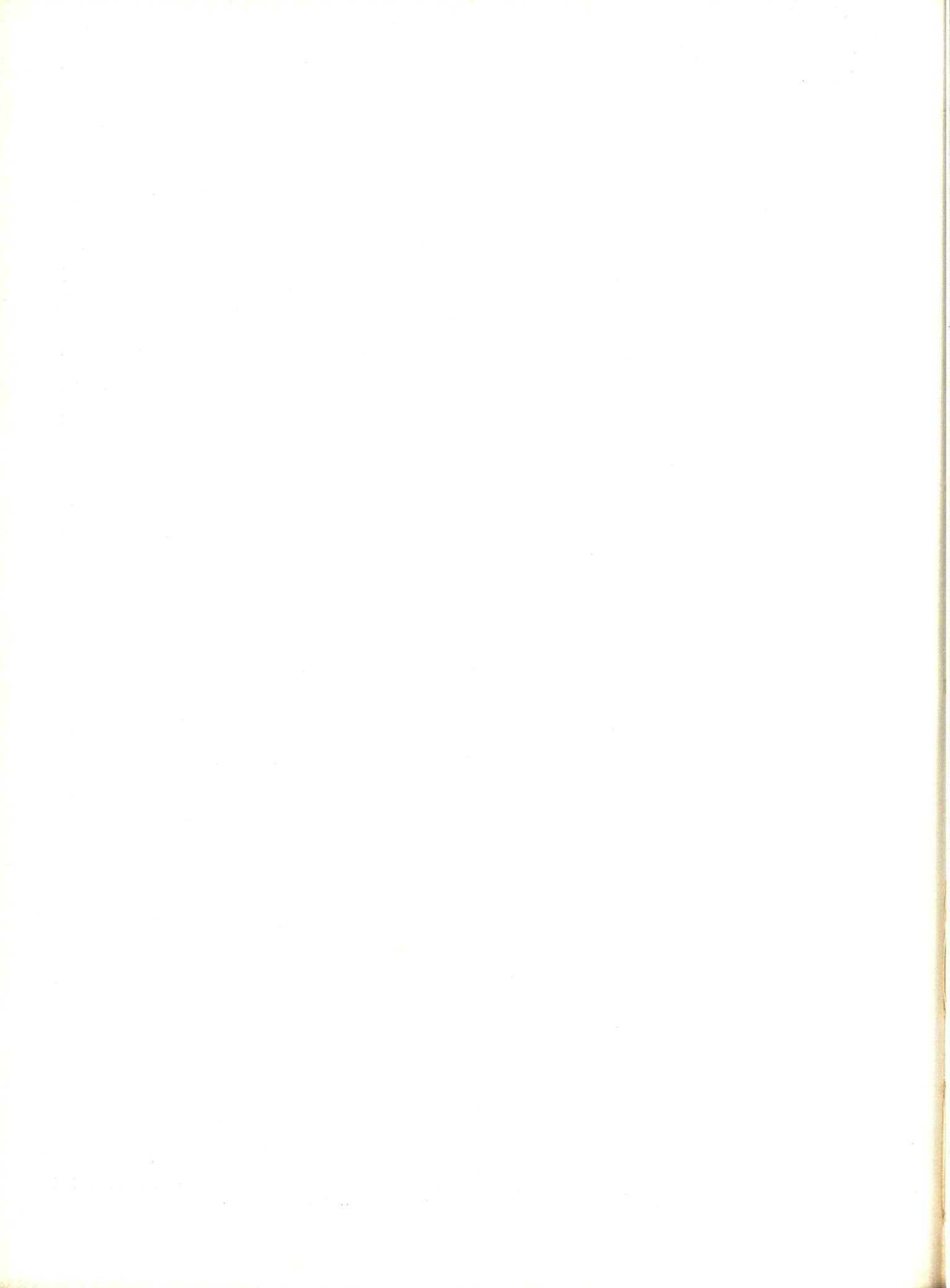
Hermastic Pipe Dip

A modification of Hermastic Enamel especially made for coating large diameter steel pipe by dipping at the pipe shop. It is melted and applied hot, usually in a vertical dipping tank into which the preheated pipes are lowered. It forms a strongly adhesive rubber-like coating approximately $\frac{1}{2}$ inch thick. Tough enough to stand rough handling and is not affected by extremes of atmospheric temperatures.

Practically every manufacturer of large diameter steel water pipe is equipped with a dipping tank and most of these tanks are filled with Hermastic Pipe Dip. Our coatings have been used on over 90% of the large diameter steel water lines laid in this country during the past decade.

Specifications and Literature

A specification to meet any given condition will be furnished on application. Write for literature.



PIPING, DRAINAGE, WATER SUPPLY
WATER CONDITIONING
PLUMBING FIXTURES

. . .

STEEL PLATE CONSTRUCTION

A. M. BYERS COMPANY

ESTABLISHED 1864

Genuine Wrought Iron Pipe, Casing, Couplings, Nipples, O.D. Tubes, Welding Fittings, Special Bending Pipe, Plates, Sheets, Culverts, Bars, Structural, Rivets and Billets

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What Is Genuine Wrought Iron?

Genuine wrought iron is a fibrous ferrous material consisting of a relatively pure iron base metal throughout which is uniformly distributed thousands of parallel threads or fibres of iron silicate. This iron silicate or slag, as it is commonly termed, is a member of the glass family and as such is non-rusting. These slag fibres always extend in the direction of rolling and are so thoroughly distributed throughout the pure iron base metal that there are approximately 250,000 of them to each cross-sectional square inch of finished material.

Genuine wrought iron is the only ferrous material that contains these non-rusting slag fibres. The slag content, which amounts to about 3 per cent, by weight, of the total, confers on the material its fibrous characteristics. In structure, a fractured piece of genuine wrought iron resembles a broken piece of hickory wood while a fractured piece of any other ferrous metal, such as steel, pure iron or cast iron, has a crystalline or granular appearance not unlike the break in a lump of sugar.

Is Genuine Wrought Iron a New and Untried Material?

Genuine wrought iron is the oldest of ferrous metals. History records its use as early as 1500 B.C. and from that time until the present it has been produced by many different methods of manufacture. After the introduction of the steel making processes it was generally thought that the new metal, steel, would supplant genuine wrought iron in all of its various fields of usefulness. This, however, as we know today, did not happen; in fact, genuine wrought iron is used more widely and is available in a greater variety of products at the present than at any other time within the past twenty-five years. The reason for this is most apparent. Genuine wrought iron is known to possess many desirable characteristics, such as extreme resistance to corrosion and vibration fatigue, which make it most desirable for those services where long life, safety and low maintenance costs are the important factors.

Specifications

For the past several years the term "wrought" has been employed by steel pipe manufacturers to distinguish their product from cast materials. This, of course, has resulted in some confusion in the preparation of specifications for piping installations. For example, in many cases where genuine wrought iron pipe was required the specifications called for "wrought" pipe and naturally steel pipe was furnished. Today, most specification writers are using the term "genuine wrought iron" in order to definitely distinguish it from other so-called "wrought" materials. In addition to that, most genuine wrought iron products are specified

in accordance with recognized standard specifications covering those products.

The American Society for Testing Materials has established several standard specifications for wrought iron products which, if used, will assure the specifier of receiving only the highest quality genuine wrought iron. These specifications are listed as follows:

Welded Wrought Iron Pipe.....A.S.T.M. Designation A72-30
Wrought Iron Plates.....A.S.T.M. Designation A42-30
Refined Wrought Iron Bars.....A.S.T.M. Designation A41-30
Wrought Iron Rolled or Forged
Blooms and Forgings for Locomotives and Cars.....A.S.T.M. Designation A73-30
Staybolt, Engine-bolt and Extra-
Refined Wrought Iron Bars.....A.S.T.M. Designation A84-30

In the preparation of piping specifications, for example, it is suggested that the specifier include a statement such as the following—"All of the genuine wrought iron pipe herein specified shall be furnished in accordance with the American Society for Testing Materials Standard Specifications for Welded Wrought Iron Pipe—A.S.T.M. Designation A72-30."

To anyone who desires to use genuine wrought iron products, such as sheets or rivets, which at the present time are not covered by standard specifications, it is suggested that a letter be addressed to our Engineering Service Department requesting copies of the Byers Standard Specifications covering those products.

Byers Genuine Wrought Iron Products

For a period of sixty-nine years—since 1864—A. M. BYERS COMPANY has directed its efforts exclusively to the manufacture of only the highest quality genuine wrought iron. The company has two plants—one at Economy, Pa., and the other on the South Side, Pittsburgh, Pa. The Economy plant, built in 1928, is the largest and most modern wrought iron mill in the world. The pipe mills in South Side, Pittsburgh, have a reputation for producing only the finest wrought iron pipe. The chemical, physical and research laboratories are completely equipped.

A. M. BYERS COMPANY recommends the use of Byers Genuine Wrought Iron Products because the modern manufacturing methods employed in their production have resulted in raising the standards of uniformity and high quality by which genuine wrought iron has always been judged.

Service Facilities

A. M. BYERS COMPANY maintains an Engineering Service Department which is at the disposal of any of our customers desiring technical information on wrought iron or its application for specialized uses. There is no charge for this service.

CHARACTERISTICS OF GENUINE WROUGHT IRON

The characteristic physical structure of genuine wrought iron, which differentiates it from all other ferrous metals, also serves to confer upon it certain highly desirable qualities. These are described briefly as follows:

Resistance to Corrosion

The durability of genuine wrought iron under corrosive service conditions is attributed partly to the purity of the base metal, but of more importance are the thousands of glass-like slag fibres that are uniformly distributed throughout the base metal. Since there are approximately 250,000 of these non-rusting slag barriers to each cross-sectional square inch of finished material, it is apparent that their action in obstructing the progress of corrosion is purely mechanical.

When corrosion attacks the surface of any ferrous metal it tends to work inward, but with genuine wrought iron it is soon opposed by the thousands of slag fibres lying so close together that they present an almost unbroken surface. Thus, due to the slag fibres in genuine wrought iron, the rate of corrosion is greatly reduced and the tendency to penetrate or pit is minimized.

Resistance to Fracture Caused by Vibration

Under many service conditions the sudden failure of materials due to vibration constitutes a serious hazard. Genuine wrought iron is used extensively in services where this condition exists because the slag fibres, which give it a structure somewhat similar to that of a stranded cable, interrupt the progress of the slip planes or "Neumann" lines resulting from fatigue and prevent sudden failure. In discussing this property of genuine wrought iron, the Director of the Bureau of Safety for the Interstate Commerce Commission made the following statement in a report on arch bars to the Commission: "The reason why wrought iron is a good metal for certain places is on account of its retention of toughness at the root of an incipient crack. A fibrous metal has this property.

A granular or crystalline metal becomes brittle when an incipient crack is once started."

Welding Characteristics

One of the outstanding characteristics of genuine wrought iron is its weldability. This virtue is due to two things: (1) the purity of the base metal, and (2) the fluxing action of the included slag. Genuine wrought iron can be easily welded by any of the commonly used methods, such as gas, electric arc, electric resistance and hammer or forge welding.

Adherence of Coatings

Users of galvanized materials, such as pipe and sheets, have found that galvanizing lasts much longer on genuine wrought iron than it does on other ductile ferrous materials. This is readily explained by the fact that the galvanizing on genuine wrought iron adheres more firmly and is from 25 to 40 per cent heavier than it is on other metals.

Physical Properties

Genuine wrought iron, due to its fibrous structure, has directional properties which are reflected in its ductility and ultimate strength in the longitudinal and transverse directions. In the longitudinal direction the ultimate strength is about 48,000 pounds per square inch and the cold ductility will vary between 12 and 30 per cent in 8 inches according to the type of material. In the transverse direction the ultimate strength is about 36,000 pounds per square inch and the cold ductility is about 5 per cent in 8 inches. In either direction the yield point is about 28,000 pounds per square inch. For special applications, however, the values given for ductility and ultimate strength can be changed by means of special rolling.

For certain applications it is often necessary that the hardness as well as the tensile properties of the material be known. The Rockwell hardness values for Byers Genuine Wrought Iron vary between B55 and B60.



Identification

Pipe—All Byers Pipe, both black and galvanized, except $\frac{1}{8}$ and $\frac{1}{4}$ in., have the name BYERS rolled in the metal at intervals of a few feet. All sizes have a red spiral stripe for quick identification.

O.D. Tubes—All Byers O.D. tubes are marked with a red spiral stripe.

Plates and Sheets—All Byers Plates have a white oval bearing the lettering—BYERS Established 1864 Genuine Wrought Iron.

Couplings—All Byers Couplings are marked with a B within a keystone, stamped in the metal.

Nipples—With the exception of close nipples, which are marked with a red band around the center, it being impractical to stamp on top of the threads, all sizes are machine stamped with the word BYERS and the weight. For example: Byers Standard would be marked BYERS STD. or Byers Extra Strong would be marked BYERS X STG.

Applications for Byers Genuine Wrought Iron Pipe

Today, most engineers realize that there is a vast difference between piping materials and that this difference is directly reflected in the length of time each material will last under given conditions without requiring maintenance or replacement. They also realize that the cost of transportation, installation, fittings, etc.,

will be practically the same regardless of the kind of pipe they use. Consequently, they are selecting their pipe on the basis of actual performance in service, which, after all, is the only reliable indication of the service that can be expected.

It is generally recognized that blanket specifications for piping systems are unsound because service conditions vary within relatively wide limits. However, here are a few of the services in industrial plants for which genuine wrought iron pipe and O.D. tubes are being used:

- (1) All Water Lines
- (2) Condensate Lines
- (3) Low Pressure Steam Lines
- (4) High Pressure Drain Lines
- (5) Low Pressure Drain Lines
- (6) Steam Trap Piping
- (7) Boiler Blow-off Piping
- (8) Boiler Feed Lines
- (9) Sanitary Lines
- (10) Brine Lines, Coils, etc., in Refrigeration System
- (11) Refrigeration Condensers (pipe for atmospheric and double pipe condensers and o.d. tubes for shell and tube condensers)
- (12) Underground Oil Lines
- (13) O.D. Tubes for Air Preheaters
- (14) Various forms of Heat Transfer Equipment

The sizes and weights of Byers Genuine Wrought Iron Pipe and O.D. Tubes are given in the tables on Pages 3 and 4.

Special Bending Pipe

Byers Genuine Wrought Iron Special Bending Pipe is a development made possible only by our modern manufacturing facilities which permit the closest control over the physical and chemical properties of the wrought iron. This pipe is particularly desirable for those services where the material must be bent to close radii and at the same time withstand corrosion or vibration or both. This pipe is available in a complete range of sizes and is furnished Plain Ends unless otherwise specified.

Applications for Genuine Wrought Iron Plates and Sheets

The term "iron," particularly as applied to plates and sheets, is frequently used in a rather loose way to embrace a large number of ferrous products, each having its own characteristics. Genuine wrought iron differs in chemical composition, physical characteristics and structure from all other ferrous metals. In plate and sheet form it possesses the same characteristics of long life and low maintenance cost associated with genuine wrought iron pipe. Although impossible to list all of the cost-saving applications, here are a few where wrought iron has replaced materials that gave too short a life to justify the overhead items of labor, transportation, maintenance and accessories incidental to a ready-to-operate and reliable installation.

Plates—Smoke stacks, breechings, coal bins and bunkers, ash handling equipment, coal chutes, dock repairs, sewage disposal plants, blast plates, coke quenching cars, tanks (processing, elevated, underground, hot and cold water storage), feed water heaters.

Sheets—Roofing and siding (plain or corrugated), ventilators and ventilating ducts, gas producer shells, gutters.

DIMENSIONS OF BYERS GENUINE WROUGHT IRON PIPE

Notes: (1) In addition to the sizes shown here, Byers Genuine Wrought Iron Pipe may be secured in sizes up to 30 ins. o.d. Information on sizes larger than 30 ins. o.d. will be given on request.

(2) Byers Genuine Wrought Iron Welding Fittings, Couplings and Nipples should always be used where the piping material is genuine wrought iron. A table of Byers Nipple sizes is given on Page 4.

(3) Sizes 4½, 7, 9 and 11 ins. Byers Standard and Extra Strong Pipe

Size	Diameter, in.		Thick- ness, in.	Weight, per ft. lb.		Thr'ds per inch	Test pressure, lb.		Couplings		
	External	Internal		Plain ends	Threads and c'plgs		Butt	Lap	Diam., in.	Lgth, in.	Wt., lb.
Byers Standard Pipe											
Black and Galvanized											
1/8	.405	.266	.069	.244	.245	27	750	.....	.640	.937	.053
1/4	.540	.360	.090	.424	.425	18	750	.....	.750	1.000	.059
3/8	.675	.489	.093	.567	.568	18	750	.....	.968	1.343	.156
1/2	.840	.617	.111	.850	.852	14	750	.....	1.078	1.343	.168
3/4	1.050	.819	.115	1.130	1.134	14	750	.....	1.312	1.531	.243
1	1.315	1.043	.136	1.678	1.684	11 1/2	750	.....	1.656	1.718	.425
*1 1/4	1.660	1.374	.143	2.272	2.281	11 1/2	750	1000	1.984	2.062	.631
*1 1/2	1.900	1.604	.148	2.717	2.731	11 1/2	750	1000	2.281	2.312	.884
*2	2.375	2.060	.158	3.652	3.678	11 1/2	750	1000	2.750	2.500	1.100
2 1/2	2.875	2.450	.212	5.793	5.819	8	.....	1000	3.312	3.125	2.500
3	3.500	3.059	.221	7.575	7.616	8	.....	1000	4.031	3.125	3.025
3 1/2	4.000	3.538	.231	9.109	9.202	8	.....	1000	4.617	3.714	4.986
4	4.500	4.016	.242	10.790	10.889	8	.....	1000	5.106	3.742	5.435
5	5.563	5.036	.263	14.617	14.810	8	.....	1000	6.281	4.125	8.250
6	6.625	6.053	.286	18.974	19.185	8	.....	1000	7.375	4.156	12.000
8	8.625	8.059	.283	24.696	25.000	8	.....	1000	9.596	6.125	26.626
8	8.625	7.967	.329	28.554	28.809	8	.....	1000	9.596	6.125	26.626
10	10.750	10.181	.284	31.201	32.000	8	.....	750	11.958	6.625	44.156
10	10.750	10.124	.313	34.240	35.000	8	.....	750	11.958	6.625	44.156
10	10.750	10.005	.372	40.483	41.132	8	.....	1000	11.958	6.625	44.156
12	12.750	12.077	.336	43.773	45.000	8	.....	750	13.958	6.625	51.991
12	12.750	11.985	.382	49.562	50.706	8	.....	750	13.958	6.625	51.991

All weights and dimensions are nominal.

*Can be furnished in both butt weld and lap weld.

Specifications—"All piping, nipples, and couplings required in (state installations whether steam, air, boiler heating, water supply, etc.) shall be of Byers Genuine Wrought Iron (state whether standard weight, extra strong or double extra strong). All pipe shall be black or galvanized" (state which).

Byers Genuine Wrought Iron Plates and Sheets are available in a complete range of sizes as shown in the tables on Page 4.

Byers Genuine Wrought Iron Culverts

Back in 1896, when the first extensive installations of corrugated metal culverts were made, genuine wrought iron was the material used. The remarkable durability of genuine wrought iron in this service is brought out by the fact that more than 85 per cent of the original culvert installations, although ungalvanized, were still in service in 1926.

Today, corrugated culverts made of genuine wrought iron are again available in diameters, thicknesses and weights per foot as shown in the table on Page 4.

Byers Genuine Wrought Iron Bars and Structural

Byers Genuine Wrought Iron in the form of rounds, squares, flats, channels and angles can be furnished in all standard weights and sizes.

Byers Genuine Wrought Iron Forging Billets

Byers Genuine Wrought Iron Forging Billets are available for the manufacture of those products for which the highest grade double refined genuine wrought iron is required. These billets are furnished in a complete range of sizes as follows: Widths, 4½ ins. and wider; thicknesses, 1½ ins. and thicker.

Welding Fittings

Welding Fittings made of Byers Genuine Wrought Iron Pipe by Taylor Forge and Pipe Works, Chicago, are available in a complete range of sizes. A table of sizes of these fittings is given in Taylor Forge and Pipe Works' catalogue, which is included in the 1933 edition of SWEET'S ENGINEERING CATALOGUES.

have been withdrawn from general production but are still available on special request.

(4) The sizes listed in the following table conform to Simplified Practice Recommendation 57-32, Wrought Iron and Wrought Steel Pipe, Valves and Fittings, as issued by the U. S. Department of Commerce. Experience has proved these sizes to be the most practical and we recommend their use.

Size	Diameter, in.		Thick- ness, in.	Weight per ft. plain ends, lb.	Test pressure, lb.		Couplings		
	External	Internal			Butt	Lap	Diam., in.	Length, in.	Weight, lb.
Byers Extra Strong Pipe									
1/8	.405	.207	.099	.314	750	....	.582	1.125	.045
1/4	.540	.295	.122	.535	750	....	.724	1.375	.073
3/8	.675	.417	.129	.738	750	....	.898	1.625	.133
1/2	.840	.539	.151	1.087	750	....	1.085	1.875	.218
3/4	1.050	.735	.157	1.473	750	....	1.316	2.125	.334
1	1.315	.949	.183	2.171	750	....	1.575	2.375	.470
1 1/4	1.660	1.269	.195	2.996	1500	2500	2.054	2.875	1.036
1 1/2	1.900	1.491	.204	3.631	1500	2500	2.294	2.875	1.170
2	2.375	1.929	.223	5.022	1500	2500	2.870	3.625	2.174
2 1/2	2.875	2.311	.252	7.661	.....	2000	3.389	4.125	3.433
3	3.500	2.887	.306	10.252	.....	2000	4.014	4.125	4.131
3 1/2	4.000	3.350	.325	12.505	.....	2000	4.628	4.625	6.289
4	4.500	3.811	.344	14.983	.....	2000	5.216	4.625	8.155
5	5.563	4.797	.383	20.778	.....	1800	6.420	5.125	12.870
6	6.625	5.743	.441	28.573	.....	1800	7.482	5.125	15.176
8	8.625	7.604	.510	43.388	.....	1500	9.593	6.125	26.626
10	10.750	9.729	.510	54.735	.....	1000	11.958	6.625	44.156
12	12.750	11.729	.510	65.415	.....	1000	13.958	6.625	51.991
Byers Double Extra Strong Pipe									
1/2	.840	.226	.307	1.714	1500	....	....	....	....
3/4	1.050	.413	.318	2.440	1500	....	....	....	....
1	1.315	.576	.369	3.659	1500	....	....	....	....
1 1/4	1.660	.874	.393	5.214	1500	....	....	....	....
1 1/2	1.900	1.078	.411	6.408	1500	2500	....	....	....
2	2.375	1.480	.447	9.029	....	2500	....	....	....
2 1/2	2.875	1.742	.565	13.695	....	2500	....	....	....
3	3.500	2.270	.615	18.583	....	2500	....	....	....
3 1/2	4.000	2.697	.651	22.850	....	2500	....	....	....
4	4.500	3.119	.690	27.541	....	2500	....	....	....
5	5.563	4.028	.768	38.552	....	2000	....	....	....
6	6.625	4.857	.884	53.160	....	2000	....	....	....
8	8.625	6.835	.895	72.424	....	2000	....	....	....

SIZES OF BYERS GENUINE WROUGHT IRON O.D. HEAT EXCHANGER TUBES

Diam- eter, ins.	Thickness, Birmingham Wire Gauge and Inches																		
	13	12	11	10	9	8	7	6	5	4	3	2	1	0	1/16"	1/8"	3/16"	1/2"	3/4"
Approximate Manufacturing Weights (Pounds per Lineal Foot)																			
1	1.06	1.19	1.30	1.34	1.42	1.50	1.58	1.66	1.73	1.81	1.89	1.97	2.05	2.13	2.21	2.29	2.37	2.45	2.53
1 1/4	1.20	1.53	1.66	1.73	1.84	2.00	2.20	2.36	2.53	2.70	2.87	3.04	3.21	3.38	3.55	3.72	3.89	4.06	4.23
1 1/2	1.63	1.86	2.03	2.11	2.24	2.46	2.70	2.92	3.02	3.23	3.46	3.69	3.84	4.04	4.24	4.42	4.56	4.75	4.94
1 3/4	1.93	2.20	2.40	2.49	2.66	2.91	3.21	3.47	3.60	3.86	4.13	4.42	4.59	4.75	5.12	5.34	5.51	5.68	5.85
2	2.08	2.36	2.59	2.69	2.86	3.14	3.46	3.74	3.88	4.17	4.47	4.78	4.99	5.14	5.55	5.80	5.99	6.16	6.34
2 1/4	2.22	2.53	2.77	2.88	3.07	3.37	3.72	4.02	4.17	4.48	4.81	5.15	5.37	5.53	5.98	6.26	6.47	6.63	6.80
2 1/2		2.86	3.14	3.26	3.47	3.82	4.22	4.57	4.75	5.10	5.48	5.88	6.14	6.34	6.85	7.18	7.43	7.63	7.83
2 3/4		3.20	3.51	3.64	3.90	4.28	4.74	5.13	5.32	5.72	6.16	6.61	6.90	7.12	7.73	8.10	8.39	8.63	8.87
3		3.53	3.87	4.03	4.30	4.72	5.24	5.68	5.90	6.35	6.83	7.34	7.67	7.92	8.60	9.02	9.35	9.63	9.91
3 1/4		3.87	4.24	4.41	4.71	5.18	5.75	6.23	6.47	6.97	7.51	8.07	8.44	8.71	9.47	9.94	10.31	10.66	11.02
3 1/2			4.61	4.79	5.13	5.63	6.25	6.78	7.05	7.59	8.18	8.80	9.21	9.51	10.34	10.86	11.27	11.64	12.01
3 3/4			4.98	5.18	5.54	6.09	6.76	7.33	7.62	8.22	8.86	9.53	10.26	10.74	11.10	12.08	12.70	13.19	13.66
4			5.35	5.56	5.95	6.54	7.26	7.89	8.20	8.84	9.53	10.26	11.51	11.89	12.96	13.63	14.15	14.64	15.11
4 1/4					6.36	7.00	7.77	8.44	8.77	9.46	10.21	10.99	11.51	11.89	12.96	13.63	14.15	14.64	15.11
4 1/2					7.18	7.91	8.78	9.54	9.93	10.71	11.56	12.45	13.04	13.48	14.70	15.47	16.06	16.56	17.04
5					8.82	9.79	10.66	11.08	11.95	12.91	13.91	14.58	15.07	16.44	17.31	17.98	19.45	21.29	24.50
5 1/4					9.50	10.55	11.48	11.94											
5 1/2					9.72	10.81	11.76	12.23	13.20	14.26	15.37	16.11	16.66	18.18	19.15	19.90	21.54	23.59	27.19
6					11.82	12.86	13.38	14.45	15.61	16.84	17.65	18.25	19.93	20.99	21.82	23.62	25.89	29.87	

Note: Specifications for o.d. tubes require that all tubes must not be less than the gauge specified in their thinnest portion, the only allowable variation being on the heavy side. Since it is not practicable to manufacture tubes to the exact theoretical weights for the various gauges, we show in the above table average shipping weights and base our list prices on these estimated weights.

SIZES OF BYERS SHEARED AND UNIVERSAL GENUINE WROUGHT IRON PLATES

UNIVERSAL PLATES

Three-sixteenths Inch and Over—Extreme Sizes

Thickness, inches	Widths, inches						
	46/40	39/36	35/30	29/24	23/18	17/15	14/13
3/16	360	420	480	540	600	720	720
1/4	420	480	540	600	720	720	720
5/16	480	540	600	720	720	720	720
3/8	540	600	720	720	720	720	720
7/16	520	580	700	720	720	720	720
1/2	460	500	600	720	720	720	720
5/8	420	480	540	720	720	720	720
3/4	360	420	480	720	720	720	720
7/8	320	400	420	720	720	720	720
1	300	360	400	720	720	720	720
1 1/8	250	300	320	720	720	720	720
1 1/4	220	260	300	720	720	720	720

SHEARED PLATES

Three-sixteenths Inch and Over—Extreme Sizes

Thick- ness, inches	Widths, inches										
	84	78	72	66	60	54	50	48	42	36	30
3/16	240	240	240	280	300	300	300	360	360	420	420
1/4	240	240	240	280	300	300	300	360	360	420	420
5/16	240	240	240	280	300	300	300	360	360	420	420
3/8	240	240	240	280	300	300	300	360	360	420	420
7/16	240	240	300	360	360	420	420	480	480	540	540
1/2	240	280	360	360	420	420	480	480	540	540	540
5/8	240	280	360	360	420	420	480	480	540	540	540
3/4	240	280	300	360	360	420	420	480	540	540	540
7/8	240	280	300	320	360	400	420	450	500	540	540
1	240	260	280	300	320	360	380	420	480	540	540
1 1/8	200	220	240	260	260	300	320	350	400	460	460
1 1/4	180	190	200	220	240	260	280	300	350	400	400

Notes: (1) Plate sizes in excess of those listed above will be given on request.

(2) In estimating the weight of genuine wrought iron, all calculations should be made approximately 2 per cent less than the weight of steel.

SIZES OF BYERS GENUINE WROUGHT IRON SHEETS

Black Sheets—Maximum Sizes

Blue Annealed Sheets

Widths	Widths, inches							
	60	56	54	52	50	48 to 30	28	26
8 gauge..... x	132	132	144	144	156	156	156	144
9 gauge..... x	144	144	144	156	156	168	168	156
10 gauge..... x	144	144	156	156	156	168	168	168
11 gauge..... x	144	180	180	180	180	180	180	180
12 gauge..... x	144	156	156	156	156	156	156	156
13 gauge..... x	144	144	144	144	144	156	144	144
14 gauge..... x	144	144	156	156	156	156	144	156
16 gauge..... x	120	144	156	156	156	156	144	156

Hot Rolled Annealed Sheets

Widths	Widths, inches			
	48 to 43	42 to 37	36 to 31	30 to 24
18 to 20 gauge..... x	120	120	144	144
21 to 22 gauge..... x	120	120	144	144
23 to 24 gauge..... x	96	120	144	144
25 to 27 gauge..... x		96	144	144
28 gauge..... x		96	144	144

Galvanized Sheets—Maximum Sizes

Widths	Widths, inches				
	48 to 43	42 to 37	36 to 31	30 to 24	
10-14 gauge..... x	144	144	144	144	
15-16 gauge..... x	144	144	144	144	
17-20 gauge..... x	120	120	144	144	
21-22 gauge..... x	120	120	144	144	
23-24 gauge..... x		120	120	144	
25-26 gauge..... x		96	120	144	
27-28 gauge..... x			120	144	

Notes: (1) Byers Genuine Wrought Iron Corrugated Roofing and Siding Sheets are available in standard widths—namely, 26 ins. for siding and 27 1/2 ins. for roofing, and in lengths up to 144 ins.

(2) These sheets are available with either 1 1/4, 2 1/2 or 3-in. corrugations.

DIMENSIONS OF STANDARD GENUINE WROUGHT IRON CULVERTS

Diam., ins.	Gauge	Wt. per ft.
8	16	7.3
10	16	9.0
10	14	11.0
12	16	10.5
12	14	12.9
15	16	12.9
15	14	15.7
16	16	13.8
16	14	16.8
18	16	15.3
18	14	18.8
21	14	22.0
24	14	25.2
30	14	30.9
30	12	43.3
36	14	38.0
36	12	51.0
42	12	59.5
48	12	68.0
54	12	77.8
60	12	85.0
66	12	96.0
72	12	106.0

BYERS GENUINE WROUGHT IRON NIPPLES
Black and Galvanized, Standard Weight

Diam. ins.	Close	Spec. short	Short	Long							Extra long							
				4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
1/8	3/4	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12
1/4	7/8	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12
3/8	1	1 1/2	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12
1/2	1 1/8	1 1/2	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12
3/4	1 1/8	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12	
1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12		
1 1/4	1 3/8	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12		
1 1/2	1 3/8	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12		
1 3/4	1 3/8	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12		
2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12			
2 1/4	2 1/8	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12			
2 1/2	2 1/8	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12			
2 3/4	2 1/8	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12			
3	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
3 1/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
3 1/2	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
3 3/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
4 1/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
4 1/2	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
4 3/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
5	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
5 1/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
5 1/2	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
5 3/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
6	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
6 1/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
6 1/2	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
6 3/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
7	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
7 1/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
7 1/2	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
7 3/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
8	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
8 1/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
8 1/2	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
8 3/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
9	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
9 1/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
9 1/2	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
9 3/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
10	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
10 1/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
10 1/2	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
10 3/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
11	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
11 1/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
11 1/2	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
11 3/4	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				
12	2 3/8	3	3 1/2	4	4 1/2	5	5 1/2	6	7	8	9	10	11	12				

JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS

Jones & Laughlin Building, PITTSBURGH, PA.

SALES OFFICES

ATLANTA, GA., 1313-14 Healey Building
Telephone, Walnut 6805

BOSTON, MASS., 250 Stuart Street
Telephone, Hubbard 5151

BUFFALO, N. Y., Liberty Bank Building
Telephone, Washington 0268

CHICAGO, ILL., 111 W. Washington Street
Telephone, Franklin 2522

CINCINNATI, OHIO, Carew Tower
Telephone, Main 2324

CLEVELAND, OHIO, Union Trust Building
Telephone, Main 7866

DALLAS, TEX., Magnolia Building
Telephones, 2-8678, L.D. 700

DENVER, COLO., 330 Continental Oil Building
Telephone, Main 2449

DETROIT, MICH., Fisher Building
Telephone, Madison 1600

ERIE, PA., Erie Trust Building
Telephone, C 54146

LOS ANGELES, CAL., 416 Roosevelt Building
Telephone, Van Dyke 6178

MEMPHIS, TENN., 1 Auction Avenue
Telephone, 64-836

MILWAUKEE, WIS., 1410 The Bankers' Building
Telephone, Daly 4418

MINNEAPOLIS, MINN., 1010 Phoenix Building
Telephone, Bridgeport 5675

NEW ORLEANS, LA., No. Miro and Japonica
Streets, P. O. Box 66
Telephone, Franklin 1131

NEW YORK, N. Y., 500 Fifth Avenue
Telephone, Lackawanna 4-8010

PHILADELPHIA, PA., Broad Street Station
Building
Telephone, Rittenhouse 0750

PITTSBURGH, PA., Jones & Laughlin Building
Telephone, Court 7400

ST. LOUIS, MO., Boatmen's Bank Building
Telephone, Garfield 4075

SAN FRANCISCO, CAL., Standard Oil Building
Telephone, Exbrook 0266

CANADIAN REPRESENTATIVES: JONES & LAUGHLIN STEEL PRODUCTS COMPANY

PITTSBURGH, PA., U. S. A., Jones & Laughlin Building
Telephone, Court 7400

TORONTO, ONT., CANADA, Toronto Daily Star Building
Telephone, Adelaide 0022

WAREHOUSES

CHICAGO, ILL.—Telephone, Virginia 1600

PITTSBURGH, PA.—Telephone, Hemlock 1000

CINCINNATI, OHIO—Telephone, Main 2324

DETROIT, MICH.—Telephone, Plaza 0470

MEMPHIS, TENN.—Telephone, 64-836

NEW ORLEANS, LA.—Telephone, Franklin 1131

LOUISVILLE, KY.—Telephone, Magnolia 1693

Products

J & L TUBULAR PRODUCTS, Standard Weight, Extra Strong, and Double Extra Strong Pipe, Black and Galvanized, for steam, gas, air, water, refrigeration and sprinkler work, fences, railing, etc.

J & L Copper-bearing Steel Pipe, when specified, can be supplied in standard weight, or extra strong black or galvanized. Use of this product is recommended where piping is to be exposed to the atmosphere.

J & L SEAMLESS TUBULAR PRODUCTS for oil and gas well drilling, pipe line construction and other purposes.

J & L HOT ROLLED SEAMLESS STEEL BOILER TUBES.

Also **J & L Structural Shapes and Fabricated Structural Work**, Columns, Girders, Trusses, Plate Work, Tanks, Mill and Factory Buildings, **J & L Junior Beams**; **J & L Wire Products.**

For **J & L Bars for Concrete Reinforcement**, **Steel Piling** and **Light Weight Channels for Stair Stringers** and other uses, see page numbers in **Manufacturers' Index.**

Description

Jones & Laughlin Steel Pipe is made of soft, weldable steel rolled from solid ingots made to a special analysis which, checked over a period of years, has proven to be very uniform in quality. The steel pipe produced from this special grade of **J & L Steel** is soft and ductile, free cutting, strong at the welds, and free from excess scale. **J & L Pipe** is reasonably straight and free from blisters, cracks or other injurious defects and is well within the allowable tolerances as to dimensions and weights, and true to round in the outside diameter.



Vast resources and complete ownership-control of every manufacturing process from the iron ore in the ground to the finished products of the tube mills, under an organization which has been producing iron and steel for over three-quarters of a century, assure the production of steel pipe of exceptional quality.

Uniform Quality

Self-owned basic materials and control under one organization of every process from the mining of the ore to the final testing of the finished pipe, result in a high degree of uniformity in the quality of **J & L Pipe** that could not otherwise be maintained.

Threading

Recognizing that a pipe installation cannot be stronger than the joint, careful attention is given the threading of the pipe with good clean-cut threads fitted with sound couplings correctly tapped to give a tight joint. Soft, ductile steel of free cutting quality enables the contractor to cut clean, sound threads on the job.

Galvanized Pipe

The Jones & Laughlin process of galvanizing assures a thorough coating and insures against pipe being clogged with spelter. The surface of the pipe is carefully cleaned so that when the galvanized coating is applied it adheres strongly and does not tend to flake off.

Identifying Marks

The name "Jones & Laughlin" is rolled in each piece of pipe as a means of identifying a quality product carefully made and finished, and rigidly tested and inspected before shipment. Specify **J & L Pipe** and have a satisfied clientele.

Specifications for J & L Welded Steel Pipe

(1) **Material**—**J & L Welded Pipe** shall be made from a uniformly good quality of soft, weldable steel rolled from solid ingots from which sufficient crop has been cut to insure sound metal in the skelp.

(2) **Process of Manufacture**—Pipe 3 in. and smaller may be made by the butt-welding process. Pipe over 3 in. shall be lap-welded; also smaller sizes as listed, when ordered as lap-welded pipe.

The welding shall be performed in accordance with the best practice in heating and rolling.

(3) **Physical Properties**—The steel used in the manufacture of the pipe shall show the following physical characteristics:

Tensile strength per sq. in.—minimum 50,000 lb.

Yield point per sq. in.—30,000 lb.

Elongation in 8 in.—20%.

(4) **Finish**—The finished pipe shall be commercially straight and free from injurious defects. All burrs at the ends of the pipe shall be removed.

Threads shall be in accordance with Briggs standard, and cut so as to make a tight joint when the pipe is tested at the mill to the specified internal hydrostatic pressure. The variation from standard, when tested with a standard working gage, shall not exceed a maximum of one and one-half turns either way.

Couplings shall be of sound metal, free from injurious defects, and tapped to such pitch diameter as to make a tight joint.

Galvanized pipe shall be coated with zinc by the hot-dipping process. The coating on the inside and the outside of the pipe shall be free from injurious defects, excessive roughness, or lumps.

Solid, tapped rings or split couplings shall be provided as thread protectors on each length of pipe 4 in. and larger.

(5) **Tests**—Each length of pipe shall be subjected at the mill to the hydrostatic test pressures per square inch as shown in the appended table.

For lap-welded pipe, a flattening test on standard weight and extra strong pipe in sizes over 2 in. shall be made by taking a section of pipe 6 in. long, which shall be flattened between parallel plates until the distance between the plates is one-third the outside diameter of the pipe, with the weld located 45° from the line of direction of the applied force, without developing cracks.

Tension test specimens shall consist either of pieces of pipe in full cross-sections, or of sections machined longitudinally from the walls of the pipe.

One tension test, and one flattening test as specified for the respective sizes, may be made on a length of pipe in each lot of 500 lengths or less of each size.

(6) **Size Variation**—Pipe 1½ in. or under shall not vary at any point more than 1/16 in. over nor more than 1/32 in. under the nominal outside diameters as shown in the table. For pipe in sizes 2 in. and over, the outside diameter shall not vary more than 1 per cent over or under the standard dimension shown in the table.

(7) **Inspection**—When so desired, pipe may be inspected at the mill, in which event the inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the pipe ordered. The manufacturer shall afford the inspector, free of charge, all reasonable facilities to satisfy him that the pipe is being furnished in accordance with these specifications. All tests and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Material which shows injurious defects subsequent to acceptance at the manufacturer's works, or which proves defective when properly applied in service, may be rejected and the manufacturer shall be notified.

J & L FULL STANDARD WEIGHT PIPE, BLACK AND GALVANIZED

All weights and dimensions are nominal

Size, in.	Diameters, in.		Thickness, in.	Weight per ft., lb.		Threads per in.	Mill test, lb.	
	External	Internal		Plain ends	Threads and couplings		Butt weld	Lap weld
1/8	.405	.269	.068	.244	.245	27	700	.....
1/4	.540	.364	.088	.424	.425	18	700	.....
3/8	.675	.493	.091	.567	.568	18	700	.....
1/2	.840	.622	.109	.850	.852	14	700	.....
3/4	1.050	.824	.113	1.130	1.134	14	700	.....
1	1.315	1.049	.133	1.678	1.684	11 1/2	700	.....
1 1/4	1.660	1.380	.140	2.272	2.281	11 1/2	700	1000
1 1/2	1.900	1.610	.145	2.717	2.731	11 1/2	700	1000
2	2.375	2.067	.154	3.652	3.678	11 1/2	700	1000
2 1/2	2.875	2.469	.203	5.793	5.819	8	800	1000
3	3.500	3.068	.216	7.575	7.616	8	800	1000
3 1/2	4.000	3.548	.226	9.109	9.202	8	.....	1000
4	4.500	4.026	.237	10.790	10.889	8	.....	1000
4 1/2	5.000	4.506	.247	12.538	12.642	8	.....	1000
5	5.563	5.047	.258	14.617	14.810	8	.....	1000
6	6.625	6.065	.280	18.974	19.185	8	.....	1000
8	8.625	8.071	.277	24.696	25.000	8	.....	800
8	8.625	7.981	.322	28.554	28.809	8	.....	1000
10	10.750	10.192	.279	31.201	32.000	8	.....	600
10	10.750	10.136	.307	34.240	35.000	8	.....	800
10	10.750	10.020	.365	40.483	41.132	8	.....	900
12	12.750	12.090	.330	43.773	45.000	8	.....	600
12	12.750	12.000	.375	49.562	50.706	8	.....	800

The permissible variation in weight is 5 per cent above and 5 per cent below.

Furnished with threads and couplings and in random lengths unless otherwise ordered.

J & L EXTRA STRONG PIPE, BLACK AND GALVANIZED

All weights and dimensions are nominal

Size, in.	Diameters, in.		Thickness, in.	Weight per ft., plain ends, lb.	Mill test, lb.	
	External	Internal			Butt weld	Lap weld
1/8	.405	.215	.095	.314	700	.....
1/4	.540	.302	.119	.535	700	.....
3/8	.675	.423	.126	.738	700	.....
1/2	.840	.546	.147	1.087	700	.....
3/4	1.050	.742	.154	1.473	700	.....
1	1.315	.957	.179	2.171	700	.....
1 1/4	1.660	1.278	.191	2.996	1500	2500
1 1/2	1.900	1.500	.200	3.631	1500	2500
2	2.375	1.939	.218	5.022	1500	2500
2 1/2	2.875	2.323	.276	7.661	1500	2000
3	3.500	2.900	.300	10.252	1500	2000
3 1/2	4.000	3.364	.318	12.505	.....	2000
4	4.500	3.826	.337	14.983	.....	2000
4 1/2	5.000	4.290	.355	17.611	.....	1800
5	5.563	4.813	.375	20.778	.....	1800
6	6.625	5.761	.432	28.573	.....	1800
8	8.625	7.625	.500	43.388	.....	1500
10	10.750	9.750	.500	54.735	.....	1200
12	12.750	11.750	.500	65.415	.....	1100

The permissible variation in weight is 5 per cent above and 5 per cent below.

Furnished with plain ends and in random lengths, unless otherwise ordered.

J & L DOUBLE EXTRA STRONG PIPE, BLACK AND GALVANIZED

All weights and dimensions are nominal

Size, in.	Diameters, in.		Thickness, in.	Weight per ft., plain ends, lb.	Mill test, lb.	
	External	Internal			Butt weld	Lap weld
1/8	.840	.252	.294	1.714	700	.....
3/4	1.050	.434	.308	2.440	700	.....
1	1.315	.599	.358	3.659	700	.....
1 1/4	1.660	.896	.382	5.214	2200	.....
1 1/2	1.900	1.100	.400	6.408	2200	3000
2	2.375	1.503	.436	9.029	2200	3000
2 1/2	2.875	1.771	.552	13.695	2200	3000
3	3.500	2.300	.600	18.583	2200	3000
3 1/2	4.000	2.728	.636	22.850	.....	2500
4	4.500	3.152	.674	27.541	.....	2500
4 1/2	5.000	3.580	.710	32.530	.....	2000
5	5.563	4.063	.750	38.552	.....	2000
6	6.625	4.897	.864	53.160	.....	2000
8	8.625	6.875	.875	72.424	.....	2000

The permissible variation in weight is 10 per cent above and 10 per cent below.

Furnished with plain ends and in random lengths, unless otherwise ordered.

READING IRON COMPANY

World's Largest Manufacturers of Genuine Puddled Iron Pipe and Puddled Iron Sucker Rods

401 North Broad Street, PHILADELPHIA, PA.

Products

READING GENUINE PUDDLED IRON PIPE.

Also Genuine Puddled Iron Couplings and Nipples; all grades of Bar Iron; Reading Charcoal Iron Boiler Tubes; Reading Cut Nails; Reading Genuine Puddled Iron Casing, Tubing, Line, Drive and Drill Pipe; Reading Sucker Rods; Heavy Marine, Engine and General Forgings; Air Furnace Castings; Cotton Compresses; Sugar Cane Mills.

Genuine Puddled Iron

Genuine Puddled Iron today has a record of resistance to the combined forces of corrosion, vibration and strain that is unequalled by any other metal in actual service.

The above statement is based, not upon theory, but upon actual data which reaches back for nearly a century. It is attested by prominent engineers and metallurgists; it is verified by the READING IRON COMPANY'S own records of the service which its product has given through four generations.

Reading is the world's oldest and largest manufacturer of genuine Puddled Iron. Reading Puddled Iron Pipe is made to the same exacting standards, with the same skill and care, that have enabled Puddled Iron to establish a reputation for superior endurance *second to none*.

Why Reading Puddled Iron Gives Better Service

Reading Puddled Iron possesses many distinct advantages. First, it is remarkably resistant to corrosion, due to the siliceous filaments uniformly distributed throughout every part of its structure. Second, Reading Puddled Iron is *fibrous* in structure—not crystalline—and is thus able to stand up under continued vibration and strain without breaking or snapping off.

Because of its superior threading qualities, Reading Puddled Iron makes joints that stay tight.

In addition, Reading Puddled Iron is remarkably easy to weld, and holds galvanizing or other coatings firmly.

For Your Protection, Insist on Reading

The American Society for Testing Materials warns against acceptance of accelerated corrosion tests as proof of longevity in its Report of Committee A-5 (Vol. 28, Part 1, P. 150).

Scientists are now generally agreed that *actual service* is the only true test of natural corrosion resistance.

The name Reading, and the Reading spiral knurl on every length of Reading Pipe, are your guarantees that the iron you are buying has proved its worth in the *tests of time*.

READING GENUINE PUDDLED WROUGHT IRON PIPE Black and Galvanized

Size	List price per foot	Diameters		Thick-ness	Weight per foot		Threads per inch	Length of thread	Taper per foot	Hydro-static test	
		Ex-ternal	In-ternal		Plain ends	Thds. and eplg.					
Standard Pipe											
Butt Weld	1 1/8	\$0.05 1/2	.405	.266	.070	.244	.245	27	1 1/2	3/4	750
	1 1/4	.06	.540	.360	.090	.424	.425	18	1 1/2	3/4	750
	1 1/2	.06	.675	.489	.093	.567	.568	18	1 1/2	3/4	750
	1 3/4	.08 1/2	.840	.617	.111	.850	.852	14	1 1/2	3/4	750
	2	.11 1/2	1.050	.819	.115	1.130	1.134	14	1 1/2	3/4	750
	2 1/2	.17	1.315	1.043	.136	1.678	1.684	11 1/2	1	3/4	750
Lap Weld	1 1/8	.23	1.660	1.374	.143	2.272	2.281	11 1/2	1	3/4	1000
	1 1/4	.27 1/2	1.900	1.604	.148	2.717	2.731	11 1/2	1	3/4	1000
	1 1/2	.37	2.375	2.060	.158	3.652	3.678	11 1/2	1	3/4	1000
	1 3/4	.58 1/2	3.500	3.059	.221	5.793	5.819	8	1 1/2	3/4	1000
	2	.76 1/2	4.000	3.538	.231	9.109	9.202	8	1 1/2	3/4	1000
	2 1/2	.92	4.500	4.016	.242	10.790	10.889	8	1 1/2	3/4	1000
Lap Weld	4	1.09	5.000	4.496	.252	12.538	12.642	8	1 1/2	3/4	1000
	4 1/2	1.27	5.563	5.036	.263	14.617	14.810	8	1 1/2	3/4	1000
	5	1.48	6.625	6.053	.286	18.974	19.185	8	1 1/2	3/4	1000
	6	1.92	7.625	7.010	.307	23.544	23.769	8	1 1/2	3/4	1000
	7	2.38	8.625	8.059	.283	24.696	25.000	8	1 1/2	3/4	800
	8	2.88	9.625	9.067	.329	28.554	28.809	8	1 1/2	3/4	1000
Lap Weld	9	3.45	10.750	10.181	.284	31.201	32.000	8	2 1/4	3/4	900
	10	3.20	10.750	10.124	.313	34.240	35.000	8	2 1/4	3/4	800
	10	4.12	10.750	10.005	.372	40.483	41.132	8	2 1/4	3/4	900
	11	4.63	11.750	10.985	.382	45.557	46.247	8	2 1/4	3/4	800
	12	4.50	12.750	12.077	.336	43.773	45.000	8	2 1/2	3/4	600
	12	5.07	12.750	11.985	.382	49.562	50.706	8	2 1/2	3/4	800
Lap Weld	14 O.D.		14.000	13.250	.375	53.510	55.712	8	3	3/4	700
	15 O.D.		15.000	14.250	.375	57.437	59.859	8	3	3/4	700
	16 O.D.		16.000	15.250	.375	61.364	63.927	8	3	3/4	600
	17 O.D.		17.000	16.250	.375	65.292	69.436	8	3	3/4	550
	18 O.D.		18.000	17.250	.375	69.219	73.681	8	3	3/4	550
	20 O.D.		20.000	19.250	.375	77.073	82.078	8	3	3/4	550

Furnished with threads and couplings and in random lengths unless otherwise ordered.

All weights given in pounds; dimensions in inches. All weights and dimensions are nominal.

The weight per foot of pipe with threads and couplings is based on a length of 20 ft., including the coupling, but shipping lengths of small sizes will usually average less than 20 ft.

Permissible variation in weight is 2 1/2 % below and 5 % above weights given in tables.

All weights are figured on the basis of 1 cu. in. of Wrought Iron weighing .2778 lbs.

All pipe threaded to Briggs' Standard Gauges as made by Pratt & Whitney Co., Hartford, Conn.

Size	List price per foot	Diameters		Thickness	Weight per foot plain ends	Hydro- static test	
		External	Internal				
Extra Strong Pipe							
Butt Weld	$1\frac{1}{8}$	\$0.12	.405	.210	.098	.314	750
	$1\frac{1}{4}$	.07 $\frac{1}{2}$	.540	.295	.122	.535	750
	$1\frac{3}{8}$	.07 $\frac{1}{2}$	.675	.417	.129	.738	750
	$1\frac{1}{2}$	.11	.840	.539	.151	1.087	750
	$1\frac{3}{4}$	.15	1.050	.735	.157	1.473	750
	1	.22	1.315	.949	.183	2.171	750
	$1\frac{1}{4}$	.30	1.660	1.269	.195	2.996	1500
	$1\frac{1}{2}$	.36 $\frac{1}{2}$	1.900	1.491	.204	3.631	1500
	2	.50 $\frac{1}{2}$	2.375	1.929	.223	5.022	2500
	Lap Weld	$1\frac{1}{4}$	.30	1.660	1.269	.195	2.996	2500
$1\frac{1}{2}$		.36 $\frac{1}{2}$	1.900	1.491	.204	3.631	2500
2		.50 $\frac{1}{2}$	2.375	1.929	.223	5.022	2500
$2\frac{1}{2}$		.77	2.875	2.311	.282	7.661	2000
3		1.03	3.500	2.887	.306	10.252	2000
$3\frac{1}{2}$		1.25	4.000	3.350	.325	12.505	2000
4		1.50	4.500	3.811	.344	14.983	2000
$4\frac{1}{2}$		1.80	5.000	4.275	.363	17.611	1800
5		2.08	5.563	4.797	.383	20.778	1800
6		2.86	6.625	5.743	.441	28.573	1800
7	3.81	7.625	6.603	.511	38.048	1500	
8	4.34	8.625	7.604	.510	43.388	1500	
9	4.90	9.625	8.604	.510	48.728	1500	
10	5.48	10.750	9.729	.510	54.735	1200	
11	6.10	11.750	10.729	.510	60.075	1100	
12	6.55	12.750	11.729	.510	65.415	1100	
Double Extra Strong Pipe							
Butt Weld	$1\frac{1}{2}$	\$0.32	.840	.226	.307	1.714	750
	$1\frac{3}{4}$	.35	1.050	.413	.318	2.440	750
	1	.37	1.315	.576	.369	3.659	750
	$1\frac{1}{4}$	.52 $\frac{1}{2}$	1.660	.874	.393	5.214	2200
	$1\frac{1}{2}$	.65	1.900	1.078	.411	6.408	2200
Lap Weld	2	.91	2.375	1.480	.447	9.029	3000
	$2\frac{1}{2}$	1.37	2.875	1.742	.567	13.695	3000
	3	1.86	3.500	2.270	.615	18.583	3000
	$3\frac{1}{2}$	2.30	4.000	2.697	.651	22.850	2500
	4	2.76	4.500	3.119	.690	27.541	2500
	$4\frac{1}{2}$	3.26	5.000	3.546	.727	32.530	2000
	5	3.86	5.563	4.028	.768	38.552	2000
	6	5.32	6.625	4.857	.884	53.160	2000
	8	7.25	8.625	6.835	.895	72.424	2000

Extra Strong and Double Extra Strong Pipe will be shipped in random lengths and with plain ends unless otherwise ordered. Random lengths are considered to be 12 to 20 ft.—5% may be 6 to 12 ft.

For cut lengths an extra charge will be made above random lengths. For pipe smoothed on the inside known as plugged and reamed, an extra charge will be made above Standard Pipe.

For Galvanized or Coated Pipe an extra charge will be made above Black.

When ordering sizes 8 in. to 12 in. please state weight of pipe wanted.

REPUBLIC STEEL CORPORATION

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YOUNGSTOWN, OHIO

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For Other Republic Products, see Manufacturers' Index

TONCAN IRON PIPE

Butt Weld, Lap Weld and Electric Weld

Standard, Extra Strong and Double Extra Strong—Black and Galvanized

Toncan Iron—What It Is

Toncan Iron is a ferrous alloy of scientifically refined iron, copper and molybdenum in correct proportions—the alloy which, among ferrous metals, ranks first in rust resistance after the stainless alloys.

Toncan Iron unquestionably represents the greatest advance in ferrous metal in more than a generation. This rather broad statement is predicated on thousands of rigid tests made in the laboratory and in actual service over a period of years.

Its Advantages as a Pipe Material

In the course of tests and service it has been proved that Toncan Iron Pipe possesses certain advantages which, stated briefly, are:

(1) It resists to a higher degree more of the many and varied types of corrosion than any other ferrous material except the stainless alloys. This resistance is not confined to the surface or "skin" of the metal, but is uniform throughout the entire wall thickness.

(2) It combines the high rust resistance of an alloy iron with many of the desirable physical properties of less resistant ferrous materials.

(3) It possesses a higher resistance than other ferrous materials to impact and to vibration fatigue.

(4) It is one of the most workable of materials, and can be handled like any iron. Unlike other ferrous materials, cold working—cutting, bending, threading—in no way affects the rust resistance of Toncan Iron Pipe.

(5) It takes a sharp clean thread easily and is not hard on dies.

(6) It welds more easily than other ferrous pipe. The use of Toncan Iron welding fittings and welding rod insures an installation of equal rust and corrosion resistance throughout.



(7) It takes and holds a galvanizing coating equal to that found on the best quality iron pipe, adding the protection of a heavy coating of zinc to the already high rust resistance of the pipe material itself.

(8) Through its longer trouble-free life it has been found to cost far less per year of service. Its use is more than an economy. It is insurance against pipe failures and frequent costly replacements.

Toncan Iron Electric Weld Pipe

Toncan Iron Electric Weld Pipe is the result of combining a wonderful welding process with a material that is a metallurgical triumph. It totals the advantages of electric welding with the quality of a long-lasting, rust-resisting alloy iron. It boasts a weld that is 100 per cent as strong as the pipe wall. It is perfectly round, of uniform wall thickness and free from scale inside and outside. Toncan Iron Electric Weld Pipe is available in sizes 2 to 16-in. O.D.—the only iron pipe available in Electric Weld. Tubing, casing and drive pipe may also be had made of Toncan Iron.



Identification

Every length of Toncan Iron Pipe is painted blue, and is marked with the name "Republic" in raised letters. Couplings are blue and stamped RT.

Literature

The new edition of "Toncan Iron Pipe for Permanence" contains interesting and valuable facts concerning the remarkable performance of this rust-resisting pipe. Write for a copy.

TONCAN IRON PIPE—SIZES AND WEIGHTS
Black and Galvanized—All Weights and Dimensions Are Nominal

Size, in.	Diameters, in.		Thick- ness, in.	Wt., per ft., lb.		Threads per in.	Couplings			Test pressure in pounds		Diameters, in.		Thick- ness, in.	Wt. per ft., plain ends	Test pressure in pounds	
	External	Internal		Plain ends	Thds. & cpgs.		Diam., in.	Length, in.	Wt., lb.	Butt	Lap	External	Internal			Butt	Lap
3/4	.540	.364	.088	.424	.425	18	.685	1	.044	700		.540	.302	.119	.535	700	
3/8	.675	.493	.091	.567	.568	18	.848	1 1/4	.072	700		.675	.423	.126	.738	700	
1/2	.840	.622	.109	.850	.852	14	1.024	1 3/8	.118	700		.840	.546	.147	1.087	700	
3/4	1.050	.824	.113	1.130	1.134	14	1.281	1 5/8	.214	700		1.050	.742	.154	1.473	700	
1	1.315	1.049	.133	1.678	1.684	11 1/2	1.576	1 7/8	.350	700		1.315	.957	.179	2.171	700	
1 1/4	1.660	1.380	.140	2.272	2.281	11 1/2	1.950	2 1/8	.546	700	1000	1.660	1.278	.191	2.996	1500	2500
1 1/2	1.900	1.610	.145	2.717	2.731	11 1/2	2.218	2 3/8	.758	700	1000	1.900	1.500	.200	3.631	1500	2500
2	2.375	2.067	.154	3.652	3.678	11 1/2	2.760	2 5/8	1.233	700	1000	2.375	1.939	.218	5.022	1500	2500
2 1/2	2.875	2.469	.203	5.793	5.819	8	3.276	2 7/8	1.755	800	1000	2.875	2.323	.276	7.661	1500	2000
3	3.500	3.068	.216	7.575	7.616	8	3.948	3 1/8	2.549	800	1000	3.500	2.900	.300	10.252	1500	2000
3 1/2	4.000	3.548	.226	9.109	9.202	8	4.591	3 3/8	4.328		1000	4.000	3.364	.318	12.505		2000
4	4.500	4.026	.237	10.790	10.889	8	5.091	3 5/8	5.410		1000	4.500	3.826	.337	14.983		2000
4 1/2	5.000	4.506	.247	12.538	12.642	8	5.591	3 5/8	5.984		1000	5.000	4.290	.355	17.611		1800
5	5.563	5.047	.258	14.617	14.810	8	6.296	4 1/8	9.158		1000	5.563	4.813	.375	20.778		1800
6	6.625	6.065	.280	18.974	19.185	8	7.358	4 1/8	10.823		1000	6.625	5.761	.432	28.573		1800
7	7.625	7.023	.301	23.544	23.769	8	8.358	4 1/2	12.390		1000	7.625	6.625	.500	38.048		1500
8	8.625	8.071	.277	24.696	25.000	8	9.420	4 5/8	15.843		800	8.625	7.625	.500	43.388		1500
8	8.625	7.981	.322	28.554	28.809	8	9.420	4 5/8	15.843		1000						
9	9.625	8.941	.342	33.907	34.188	8	10.420	5 1/8	19.752		900	9.625	8.625	.500	48.728		1500
10	10.750	10.192	.279	31.201	32.000	8	11.721	6 1/4	33.923		600						
10	10.750	10.136	.307	34.240	35.000	8	11.721	6 1/4	33.923		800						
10	10.750	10.020	.365	40.483	41.132	8	11.721	6 1/4	33.923		900	10.750	9.750	.500	54.735		1200
11	11.750	11.000	.375	45.557	46.247	8	12.721	6 3/8	36.970		800	11.750	10.750	.500	60.075		1100
12	12.750	12.090	.330	43.773	45.000	8	13.958	6 3/4	48.266		600						
12	12.750	12.000	.375	49.562	50.706	8	13.958	6 3/4	48.266		800	12.750	11.750	.500	65.415		1100

JOSAM MANUFACTURING COMPANY

Floor and Roof Drains—Swimming Pool Equipment—Grease, Oil, Dental, Surgical and Hair Interceptors

MAIN SALES OFFICE
CLEVELAND, OHIO

REPRESENTATIVES IN
ALL PRINCIPAL CITIES

FACTORY AND FOUNDRY
MICHIGAN CITY, IND.

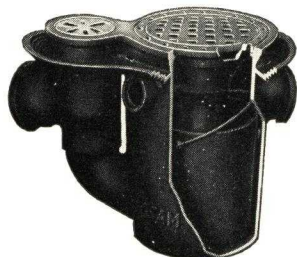
JOSAM-PACIFIC CO.—Manufacturers and Distributors of Josam Products in California, Washington, Oregon, Utah, Idaho, Nevada, Arizona
Main Sales Office: 765 Folsom Street, SAN FRANCISCO, CAL.; Sales Offices in LOS ANGELES, SEATTLE and SALT LAKE CITY
EMPIRE BRASS MFG. COMPANY, LTD.—Manufacturers and Distributors of Josam Products in Canada. Main Office: LONDON, ONT., CAN.

Series 200AC



Double drainage combined trap and drain. C. I. body with adjustable brass strainer. With or without flashing clamping device

Series 970NC



Josam Non-Clog Triple Drainage Oil Retaining Drain and Trap for wash racks, garages, roadways or manufacturing plants, where drainage water must be freed from oils and sediment before discharging into sewer lines. 4-in. outlet. Cast iron

Series 750A



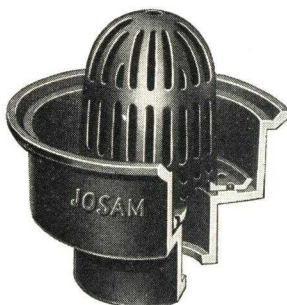
Combined drain and deep seal trap with backwater valve and threaded brass cleanout. C. I. body. Brass top when desired

Series 300C



Double drainage drain without trap, recommended for shower receptors, urinals and floors. C. I. body and adjustable brass strainer with or without flashing clamping device

Series 5200



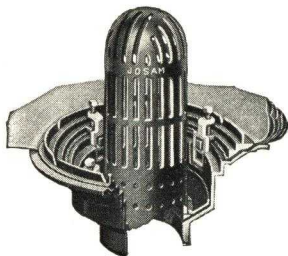
Recent design and moderately priced area or floor drain with easily removable dome strainer and sediment cup. Adaptable to areaways or passage ways either covered or grated. 2, 3 and 4-in. bottom or side outlet. All cast iron or with brass top

Series 5400



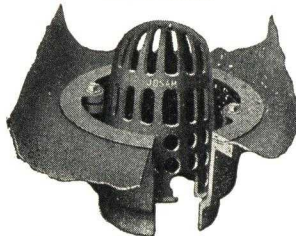
Non-Clog drain with removable sediment container. This non-clog feature allows continual floor drainage even after sediment container has been completely filled. 2, 3 and 4-in. bottom outlet. Cast Iron with brass top

Series 410S



Improved roof drain with removable combined sediment cup and dome strainer. Positive clamping method to securely hold roofing to drain body. Also furnished with side outlet or square top when desired. Flat Top Promenade Type Series 420SP

Series 450G



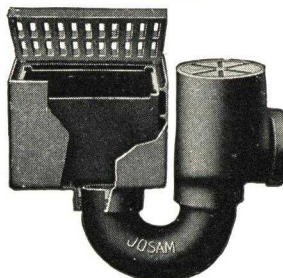
Improved roof drain with removable combined dome strainer and sediment cup for narrow valleys or gutters. Can be furnished with side outlet or square top flange

Series 510



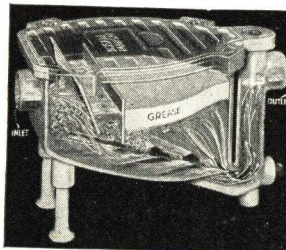
Double drainage drain or cesspool. C. I. body and grate. Brass top when so desired. Also side outlet designated as Series 550R

Series 710A



Heavy duty combined drain and deep seal trap with hinged grate, removable sand bucket and threaded brass cleanout. For large areas where drainage has considerable sediment. 2, 3 and 4-in. sizes. Cast iron or with brass top

Grease Interceptor



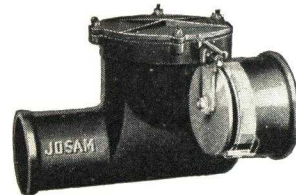
Josam-Marsh Grease Interceptor non-water jacketed. Will recover grease from waste water regardless of temperature. Evacuates sediment and heavy matter

Series 530A



Extra heavy double drainage drain. C. I. body and grate with supplementary strainer. Brass top when desired

Series 1100



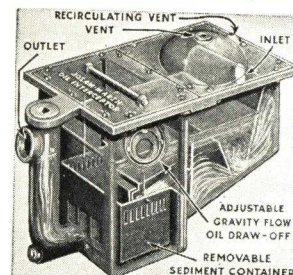
Open seat backwater sewer valve. Positive acting. Bronze working parts. Iron body. C. I. bolted or threaded brass cleanout. Under normal conditions disc is open $\frac{3}{4}$ ins. permitting continuous flow. Disc swings wide open giving full waterway. Closes tightly and firmly with slightest back flow

Shock Absorber



Special alloy steel, cadmium plated. Eliminates water hammer sound and vibration in piping systems due to thrust and impact. Not an air chamber. Made in sizes from $\frac{1}{2}$ to 2 ins. Request complete 8-page Shock Absorber Folder

Josam-Marsh Oil Interceptor



Automatically discharges oil from sewer lines. The double eccentric adjustable gravity flow drawoff allows for setting draw-off at precise level for each individual installation. 2, 3, 4, 5 or 6-in. size

Request Catalogue of Josam Products—Our Engineering Dept. is at Disposal of Engineers or Architects

ACME TANK COMPANY

TELEPHONE
Cortlandt 7-0132, 7-0133

39 Cortlandt Street, NEW YORK, N. Y.

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WOODEN TANKS and STEEL TOWERS for village or factory, fire protection, water supply, etc.

TANKS and TOWERS built in accordance with specifications of National Board of Fire Underwriters or Associated Factory Mutual Fire Insurance Companies.

WOODEN TANKS for breweries, water supply, chemical and color works, and all other purposes.

GALVANIZING and PICKLING TANKS, with copper, brass, alumite, monel or extruded metal rods, nuts and washers.

WOOD VATS.

RUBBER LINED TANKS.

LEAD LINED TANKS.

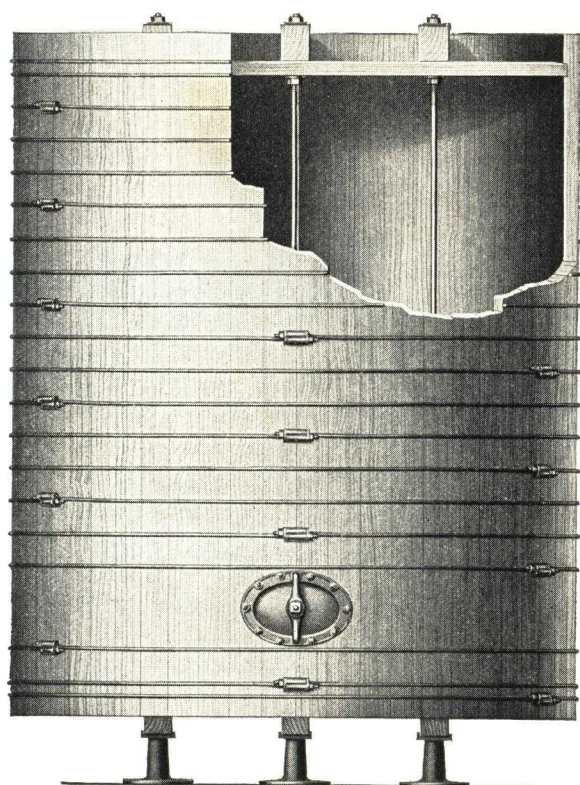
TANKS LINED with Monel, Copper and other Metals.

AGITATOR TANKS.

CONE BOTTOM TANKS.

Advantages of a Wood Tank for Brewing

Wood has many advantages over other materials for use as pressure, storage or fermenting tanks in breweries. Wood is a non-conductor, and wood tanks will hold an even temperature which is not possible with a metal container. With the use of metal tanks it is usually necessary to use heavier insulation in the cellars to maintain uniform temperature. All tanks are lined or pitched with varnish, shellac or other compounds especially prepared for this purpose. These coatings will adhere to wood better than to other materials and require less frequent renewal. Wood tanks are now being installed in most of the new breweries and are regarded by experienced brewers and brewmasters as the best material for such purposes.



200-barrel Pressure Tank

Acme Wood Tanks

Materials Used—Acme Wood Tanks are built of Red Gulf Cypress, California Redwood, Washington Fir, Yellow Pine and White Cedar.

Capacities and Sizes—Made in all sizes, round and rectangular, from 50 to 500,000 gallons. The cylindrical tank is the best form of construction and cheaper than any other. Rectangular and oval tanks are only used when special requirements make it necessary.

Capacity, gal.	Outside diameter, ft.	Outside height, ft.	Capacity, gal.	Outside diameter, ft.	Outside height, ft.
570	5	5	27,600	18	16
1,040	6	6	31,200	18	18
1,700	7	7	34,800	18	20
2,600	8	8	38,700	20	18
4,125	10	8	43,200	20	20
5,225	10	10	47,100	22	18
7,600	12	10	50,000	24	16
9,200	12	12	52,500	22	20
10,800	12	14	56,200	24	18
14,300	14	14	62,700	24	20
18,800	16	14	73,900	26	20
21,700	16	16	85,900	28	20
24,500	16	18	99,000	30	20

Data on other sizes and capacities on request.

Shipments—Shipments can be made to any part of the country from our New York, California or Illinois factories.

Vats

We also make a specialty of wood rectangular vats in any size for dyeing, plating, etc.

Acme Angle Steel Towers

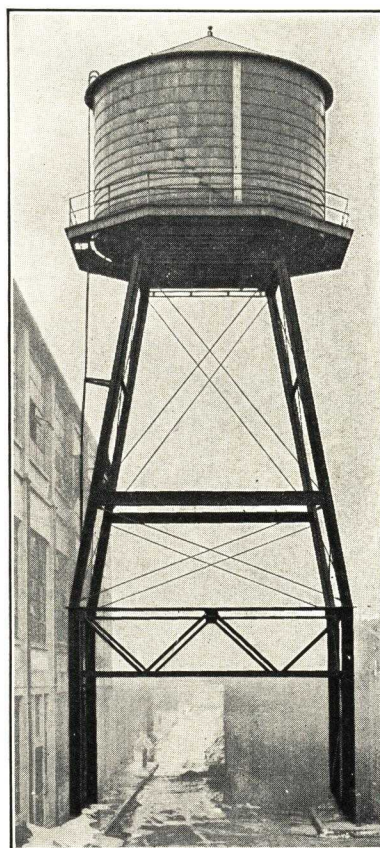
These towers are built of angle steel and designed to carry the intended load with ample factor of safety. The four columns are set on concrete or rock foundations to be provided by the purchaser. All steel work is painted at shop before shipment.

We have designs on hand for towers of all heights for tanks ranging in capacity from 1000 to 75,000 gallons.

Tower includes cap I-beams and smaller I-beam joists for support of tank bottom. No wood is used in any part of the tower and tank support. Tower ladder is included with tower. Extension beams for support of walkway, wood walkway, hand rail and bowed top tank ladder are usually provided except in the case of small towers.

All parts of these towers are shop-riveted, and arranged for field bolting, and in the small sizes are easy to erect.

The angle steel column is regarded by all authorities as the best structural form, and our towers are approved by all authorities having jurisdiction.



Unusual Tower Construction Showing Special Portal
60-ft. tower, 50,000-gal. tank

DUNCK TANK WORKS, INC.

2418 No. Thirtieth Street
MILWAUKEE, WIS.

Products

DUNCK SUPERIOR WOOD TANKS, VATS and TUBS.

One of the Oldest

Over sixty-six years of tank building experience is back of every Dunck tank.

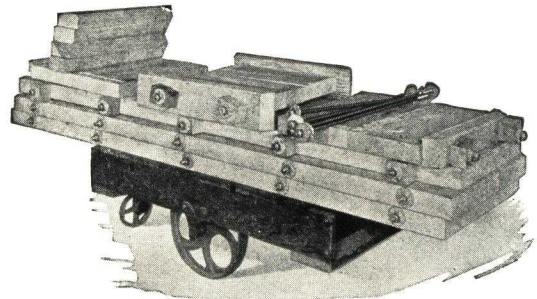
Superior Quality

Only the very best grade of lumber that the log will produce enters into the construction of Dunck Tanks. Large stock of well seasoned Gulf red cypress, California redwood, Douglas fir and other woods carried at all times.



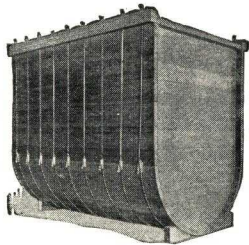
Rectangular Tanks

Built in any size and thickness; either plain or lead lined. With or without partitions, for acid pickling and plating plants, chemical manufacturers and galvanizers, dye and color plants, electrotypers, etchers and photographers, foundries, bottling plants and laundries. Thoroughly rodded vertically and horizontally with iron rods or acid resisting rods if desired.



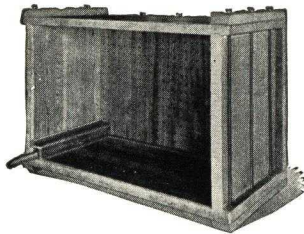
Knocked Down Rectangular Vat

Showing tank ready for shipment, plainly marked to facilitate assembling; rods left inserted in the sides, ends, bottom pieces and partition.



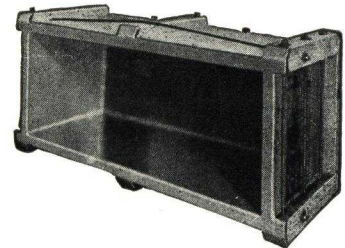
Half Round Tank

Used as stuff chests in paper mills. Built in any size or thickness.



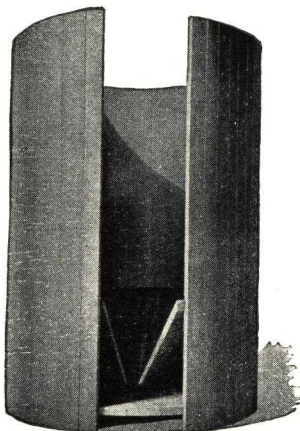
Rectangular Dye or Bleach Vat

Showing perforated false bottom with wood plug and boxing.



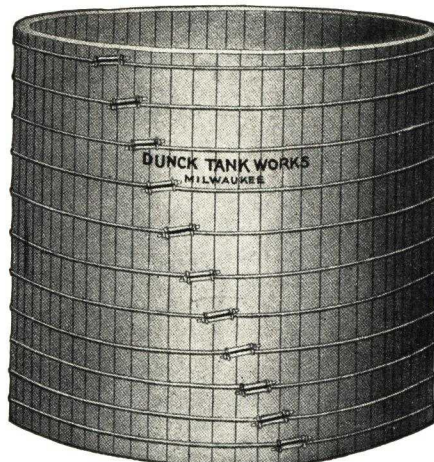
Rectangular Lead Lined Vat

Tank lined with lead. Burned joints (not soldered) with truss rod to guard against bulging.



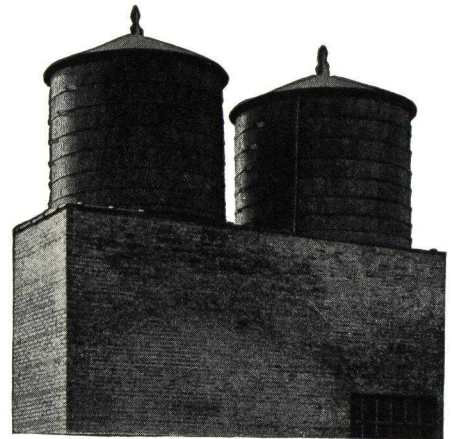
Special Construction

Cone shaped bottom tank used in paper mills.



Round Tanks

Any size and of all thicknesses of material. Substantially hooped with round iron rods fitted with malleable lugs for tightening. Staves are concaved and convexed, making a smooth surface inside and outside. Used extensively in vinegar, pickle, kraut and canning factories, chemical, dye and color plants, woolen and cotton mills, tanneries and glue plants, starch factories and paper mills, soap works, creameries, laundries, farms, summer homes, etc.



Elevated Water Storage Tanks

Tanks with standard conical covers, with prepared roofing, manhole door, etc.

HAMMOND LUMBER COMPANY

TECHNICAL DIVISION

Redwood and Douglas Fir Lumber

The World's Largest Producers of Redwood and Its Products

310 Sansome Street, SAN FRANCISCO, CAL.

COMPANY OFFICES

NEW YORK, N. Y., 370 Lexington Avenue
CHICAGO, ILL., 601 West 138th Street (Riverdale)

NEW ORLEANS, LA., New Orleans Bank Building
PORTLAND, ORE., Terminal Sales Building

LOS ANGELES, CAL., 2010 South Alameda Street

SPECIAL REPRESENTATIVES

ENDEAVOR, PA., Wheeler & Dusenbury
KANSAS CITY, MO., C. B. Baxter & Co., R. A. Long Building

DENVER, COLO., S. I. Godman, Denham Building
SALT LAKE CITY, UTAH, E. V. Smith Lumber Co., Walter Bank Building

SCOPE OF SERVICE

Engineers

Specializing in Industrial, Engineering and Contractors' Lumber and Products.

Timber Highway Bridges

We supply material for Highway Bridges in Redwood employing structural grades having unusually high stress values. Extreme durability and permanent assurance against weakening of the structure. Write for engineering treatise on "Naturally Durable" Structural Redwood.

Roof Construction

Redwood Roof Construction for acid, chemical, paper, railroad shops, textile and other plants where corrosion or humidity conditions preclude the use of any other material. The light weight of Redwood offers marked economy in supporting members.

Hangar Roofs

Hangar Roofs for airplanes or dirigibles. Redwood is particularly adapted to dirigible hangars as demonstrated by the United States Government specifying Redwood. It is highly fire-resistant.

Acid Towers and Stacks

Acid Towers and Stacks of large size for handling fluorine and other highly corrosive gases have been designed and installed by us in Canada and the United States. Our all-wood gas scrubbers for corrosive gases are noted for the satisfaction they have given.

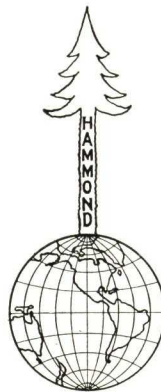
Cooling Towers

Cooling Towers in Redwood of capacities as large as 50,000 g.p.m. have been designed by us and installed in leading oil refineries in America and abroad as well as for power plants, refrigeration, and air-conditioning. Our engineers are fully qualified by experience in the design and installation of important cooling tower structures. Send for our technical publication on Cooling Towers.

Wood Pipe

Wood Pipe for water supply, hydro-electric power, acid conveyors, hot acid waste from oil refineries, chemical and textile plants. Available in diameters as small as 2 in. and as large as 18 ft. Installed by us anywhere. Bored pipe for tanneries and acid plants, lining for iron pipe for high pressure in mines, standard wire wrapped pipe and standard continuous stave pipe in Redwood and Douglas Fir. Write for our technical publication "Pipe Engineering." It is a complete engineering treatise on wood pipe and its uses.

Wholesalers



Manufacturers

Designers and Manufacturers of the following equipment for Industrial and Other Purposes.

Wood Tanks

Our tanks in Redwood and Douglas Fir are installed in the leading industrial, chemical, paper, food products, vinegar, textile, and mining plants in America and abroad. We specialize in gas-tight tanks and vats for the brewing industry and utilize principles of cooerage which have been successfully applied in Germany, Bohemia, Austria, and other brewing centers of world importance. We are informed on the characteristics of all American woods for tank purposes for the process industries and will furnish data on request. Send for our "Tank Engineering" containing an engineering discussion of tank foundations.

"Coreboard"

A light weight partition material and general utility board with Redwood center and heavy paper exterior. It is a quality product and can be relied upon for long and satisfactory service. Write for samples and prices.

Stadium Seats and Fence Construction

The extreme durability of Redwood under severe exposure conditions is certified by its use in many of the principal stadiums of the country. Write for designs and data.

Sludge Bed Enclosures and Greenhouses

Redwood has been a standardized material for many years past for the severe conditions surrounding this use. We can furnish manufactured material to meet any specification however rigid or exacting.

Redwood Lumber for All Purposes

Redwood is truly an all-purpose wood—particularly suited to industrial plant construction, permanent, requires no treating, is highly fire-resistant and hence eliminates the fire hazard of treated wood. Available in all sizes and a variety of grades that adapt it to every industrial need. It is a low cost wood. Immediate shipments available by rail or water to any part of the world. We solicit inquiries from owners, engineers, architects, contractors and lumber dealers and will analyze, free of cost, the adaptability of Redwood to industrial or manufacturing processes where other woods have failed to give satisfaction.

Our engineering staff has designed a wide variety of general and special Redwood structures and equipment and is competent to handle your problem.

Engineering Data and Estimates on Request

The world's largest producer of Redwood maintains an Engineering Department for scientifically answering your questions. There is no obligation to buy in addressing us for engineering data or the estimated cost of any of the foregoing described engineering structures or lumber.

THE HAUSER-STANDER TANK CO.

Spring Grove Avenue and Ammen Street, Winton Place
CINCINNATI, OHIO

Products

HAUSER-STANDER WOOD TANKS, VATS, TUBS and DRUMS; RUBBER LINED WOOD and STEEL TANKS and SPECIAL EQUIPMENT; AGITATOR DRIVES, PULLEY TYPE or DIRECT CONNECTED GEAR REDUCTION, and STIRRERS.

Quality of Products

For over 60 years we have been building wooden tanks for all purposes, our products being used in all parts of the world. During this period we have developed and improved our construction and offer wooden tanks perfect in every detail. Lumber is tank grade (not inferior selects), thoroughly air seasoned and each tank is mechanically correct. Our slogan is "We Win with Quality."

Hauser-Stander products are guaranteed. If products do not meet with every claim made, they can be returned at our expense and we will promptly replace or refund money, together with freight charges paid by the customer.

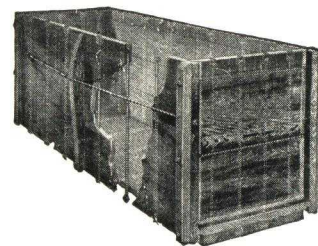
All Tanks Built to Order

We make all tanks for customer's special requirements. No stock goods carried. Write for our complete catalogue.



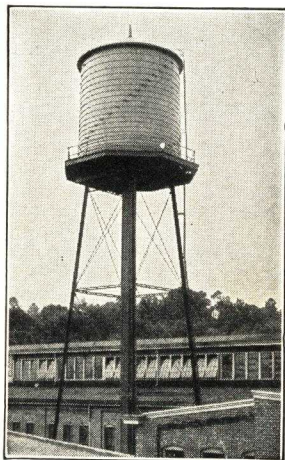
Pressure Vacuum Tank

Made to desired specifications to withstand high pressures. Each tank tested before leaving the plant



Rectangular Tank

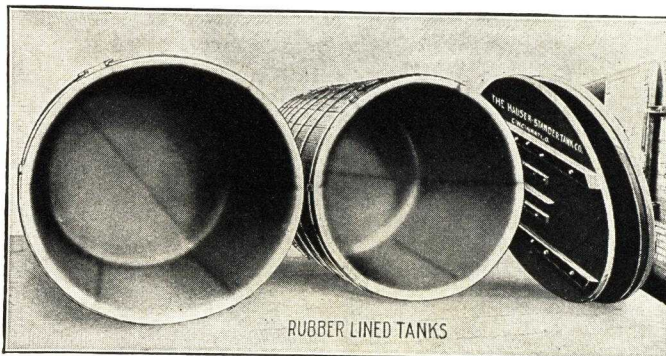
Made any size, plain or lined with lead, rubber, copper, monel, special alloy steels, pitch, etc., for chemical and general industrial purposes. Built of genuine Tidewater red cypress, Redwood, long leaf yellow pine or Douglas fir. The construction prevents bulging or warping



60,000-gal. Tidewater Red Cypress Tank

Made of tank grade Tidewater red cypress, Redwood or Douglas fir, in accordance with the specifications of the National Board of Fire Underwriters and Associated Factory Mutual Fire Insurance Companies.

Also for private systems. Furnished with frostproof conical and flat roofs, riser boxing, etc.



RUBBER LINED TANKS

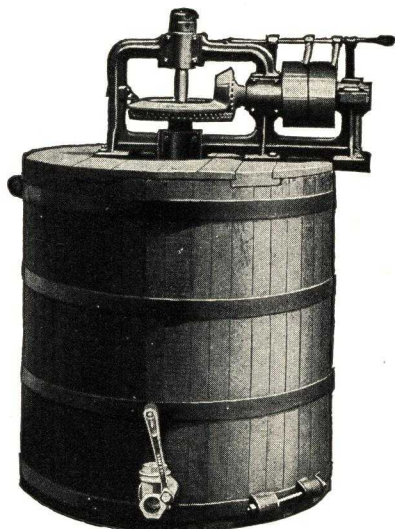
Rubber Lined Tanks

Made of wood or steel for storage, processing or transportation of acids and other chemical solutions. Rubber lined tank cars furnished complete



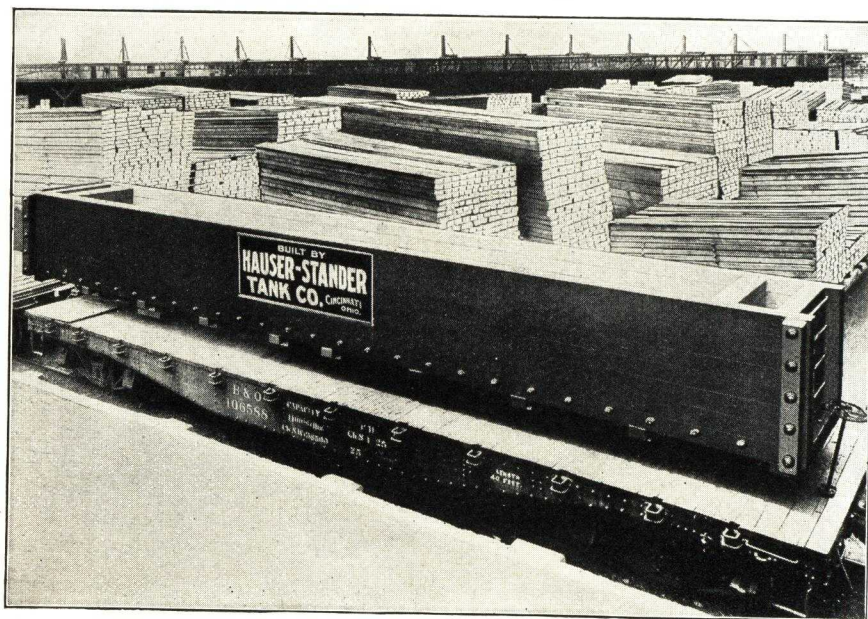
Round Tank

Made open top or double headed in any size from 100 to 500,000-gal. capacity, of genuine tank grade Tidewater red cypress, Redwood, Douglas fir, yellow poplar, Southern long leaf yellow pine and quartered or plain white oak. Fitted with covers, launders or false bottoms of wood or acid resisting metal



Agitator Tank

Sound design, sturdy mechanism, stirrers of all wood, steel, cast iron or acid resisting metal in propeller, gate or turbine design



Heavy Pickling Tanks

Made for all purposes of special timbers cut to our rigid specifications. Mechanically correct—plain or plunger type, rectangular, elliptical or round. The various acid resisting metals are used for tie rods, hoops, braces, guides, etc.

PACIFIC TANK & PIPE COMPANY

Wood Tanks and Wood Pipe

232 California Street, SAN FRANCISCO, CALIF.

LOS ANGELES, CALIF., 122 West Jefferson Boulevard

NEW YORK, N. Y., 17 Battery Place, Dept. "A"

SALT LAKE CITY, UTAH, 606 McCornick Building

Products

ROUND, HALF ROUND, OVAL, and RECTANGULAR TANKS of all capacities, made from California Redwood and Douglas Fir.

WOOD and STEEL TOWERS for elevated tanks.

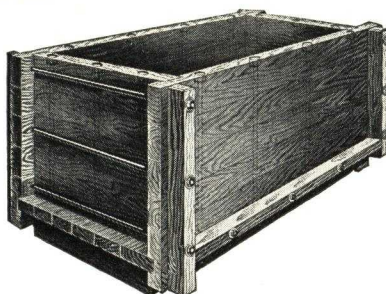
MACHINE BANDED, CONTINUOUS STAVE and BORED PIPE, and STEAM PIPE CASING.

Also Atmospheric Cooling Towers.

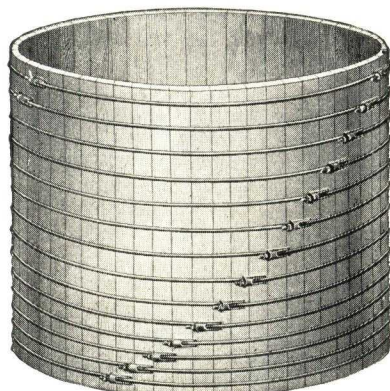
Tanks

Round tanks of all sizes, fitted with round copper bearing steel hoops and malleable iron straight pull lugs—the best containers for chemical solutions.

Rectangular tanks made to fit any particular or unusual requirement. All exposed metal parts on top and inside of tank protected. Made with monel metal rods if desired.



Standard Rectangular Tank
Made in all sizes



Standard Tank

Made in all standard sizes and capacities from 65 to 500,000 gal.

Brewers' Wood Tanks

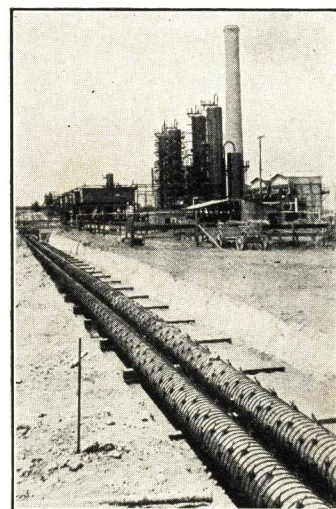
We are supplying both vertical and horizontal redwood and fir tanks to brewers—fermenting, settling and pressure tanks, vats, mash tubs and cooling towers. Our large stocks of lumber and manufacturing equipment enable us to take care of all demands quickly. Wood tanks are preferred for their long life—corrosion does not affect them. They are shipped knocked down, ready for assembly in brewery cellars by your men or by our experienced coopers and tank builders. The extra amount of paint and refrigeration required for steel tanks will more than pay for varnishing the inside of wood cooperage.

Pipe

Machine banded wood stave pipe in sizes from 2 to 30 inches. Wound with copper or galvanized wire for corrosive solutions. Bored redwood log for acid and brine. Wood covering for steam pipes.

Continuous stave pipe for sizes 12 inches in diameter and larger. Suitable for water works systems, mills, mines and manufacturing plants.

Wood pipe has proved its value wherever conditions require pipe that will resist acids and other corrosive influences. Send us your specifications—our engineering staff is at your service.



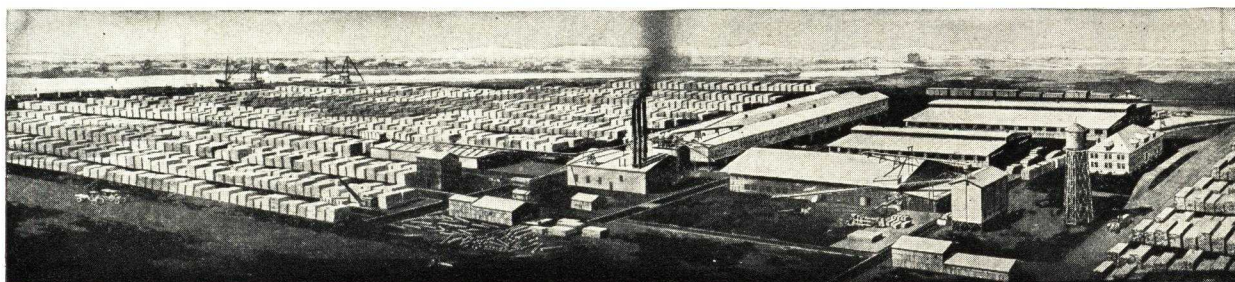
Continuous Stave Redwood Pipe for Industrial Plants



Length of Machine Banded Pipe

Catalogues

We will be glad to send our catalogues on request. Please specify whether pipe or tank catalogue is wanted.



Where Pacific Products Are Made
The standard since 1888

REDWOOD MANUFACTURERS COMPANY

Remco Redwood Tanks, Pipe and Cooling Towers

Hobart Building, SAN FRANCISCO, CALIF.

BOSTON, MASS., 176 Federal Street

CHICAGO, ILL., 332 So. La Salle Street

Products

REDWOOD LUMBER; WOOD STAVE PIPE; BORED WOOD PIPE; WOOD TANKS; TANK TOWERS; COOLING TOWERS—"From Tree to Consumer."

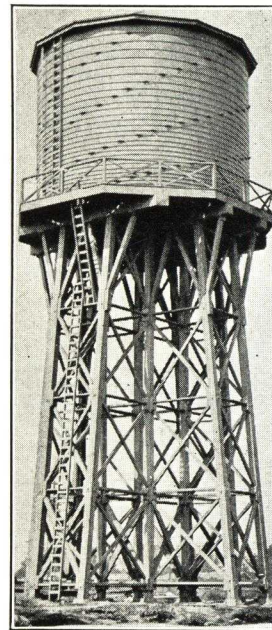
REMCO

For Mechanical Perfection

Remco Redwood Tanks

Remco Redwood Tank staves are milled in the same manner as the pipe staves, except that the tongue and groove are omitted. Each tank is cinched with round copper-bearing steel bands interlocked with malleable iron lugs. Remco Red-

wood Tanks are used extensively for water and oil storage, chemical and mining plants, tanneries, wineries, pickle and vinegar works. Remco tanks are also supplied in rectangular designs.



75,000-gal. Tank on 50-ft. Tower

Engineering Service and Erection

A staff of efficient engineers is prepared to deal with problems involving the use of all of the Company products. Catalogues, prices, and engineering data will be sent upon request without cost or obligation. All products are erected by the Company when desired.

Remco Redwood Pipe

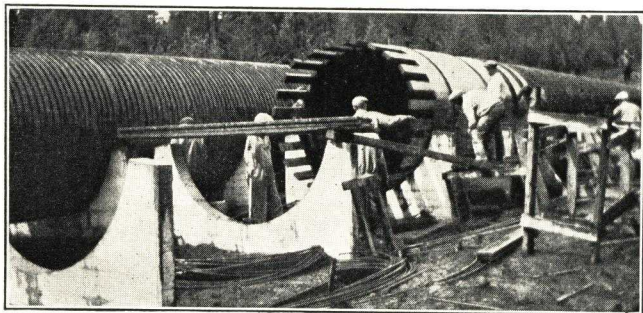
Redwood pipe has the following advantages over other types of pipe:

(1) Its first cost is low; its maintenance practically nothing.
(2) Its flow qualities are not affected by interior surface irregularities; during its entire life it remains free from growths, tuberculation, and flow diminution.

(3) It is immune from attacks by insects or worms; adverse soil conditions; wet or dry, cold or warm climates. Since the wood is a poor conductor of heat, the possibility of freezing of the liquid is reduced to a minimum, and no expansion joints are required. Redwood pipe in operation will not burn.

(4) It may be laid with equal efficiency underground or on the surface.

Remco Redwood Pipe is a barrel of wood staves cinched into a strong, arched shell by the binding element—either wire



Twain 87-in. Power Lines in Oregon

wound spirally, or individual steel bands. The staves are made from clear, thoroughly dried redwood, free from knots, sap, dry rot, wind checks, pitch, pitch seams, pitch pockets, or other defects. Each stave is a mathematically calculated section of a true circular shell, and is provided with a tongue on one radial edge and a groove on the other. When stress is exerted on the pipe shell by liquids, resistant hoop tension is supplied by the binding element.

Remco Redwood Pipe is built to withstand static pressure heads that vary from zero to 350 ft.; the diameters range from 2 in. to 16 ft.

Continuous Stave Pipe—Built in the field without any breaks for connection of separate sections. Banded with individual, round steel bands.

Machine Banded Pipe—Spirally wound in factory either with galvanized, copper-bearing steel wire fastened with sherardized clips, or with pure, hard-drawn copper wire fastened with copper clips. The various lengths are joined by a patented collar and expanded tenon arrangement. After winding, pipe is dipped in asphalt and rolled in sawdust.

Bored Pipe—For conveying liquids which preclude use of metal. Made by boring through center of pieces of straight grained, clear redwood. Ends of pipe equipped with male and female joints and sections driven firmly together.

Remco Redwood Cooling Towers

The REDWOOD MANUFACTURERS COMPANY designs and furnishes the complete materials for the following types of towers:

(1) Atmospheric type: This tower functions by cross current flow of the wind over the wetted cooling surface.

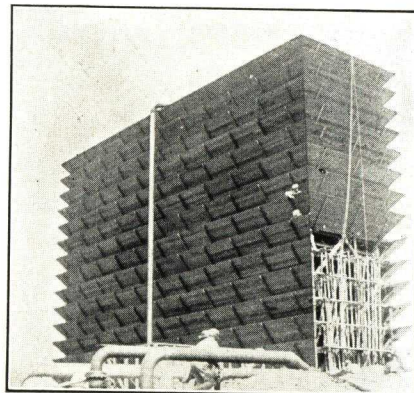
(2) Atmospheric type equipped with heat exchange units. This tower is equipped with highly efficient cooling and condensing coils. The cooled water drops directly onto the surfaces of the coils, and then into the collecting basin. Installations are furnished complete with heat exchange units.

(3) Forced Draft Type. This tower employs a mechanically supplied vertical draft of air which passes over an internal filling of fixed surface. Installations are furnished complete with either disc or airplane fans, bearings, and supports.

Remco Cooling Towers are manufactured from Redwood specially selected for cooling tower construction. The wood contains an acid which renders it immune from insect attack, and which is generally accredited with furnishing its admitted immunity from decay. It has been demonstrated in hundreds of cases that many strong solutions of either acids or alkalis that will readily destroy metals have no effect on Redwood.

These inherent qualities make Redwood superior to all other woods for cooling tower construction. The towers are shipped from the factory complete in manufacture and materials, and ready to erect. The Company manufactures a number of standard types of cooling towers. In some cases, however, it is necessary to depart from the standard and install a special type. Our Engineering Department is prepared to deal

with any cooling tower problem, whether structural or thermal. Plants containing refrigeration systems; steam condensers; water jacketed internal combustion engines and compressors; large electrical transformers; oil refining equipment, etc., will find the Company at their service in all water cooling matters.



Remco Cooling Tower for Heat Exchange Units

A. WYCKOFF & SON COMPANY

(78th ANNIVERSARY—1855-1933)

Manufacturers of Underground and Exposed Wood Pipe for Water and Steam
The Originators of Machine-made Wood Pipe

ELMIRA, N. Y.

Products

MACHINE-MADE WOOD STAVE PIPE for water works systems, power plants, paper mills, manufacturing plants, mines, railroad water supplies and chemical plants.

SOLID BORED WOOD PIPE available in various sizes.
UNDERGROUND WOODEN STEAM PIPE CASING.

Woods Used in Wyckoff Pipe and Their Advantages

California Redwood—Clear, all heart stock. No corrosion with age to decrease capacity; lower costs and longer life; shipping and handling costs are low and installation economical because of light weight and small units; not affected by electrolysis, soil condition, worms, insects or the famous termite of the tropics. Redwood is rot resistant.

Successfully withstands moist, hot climates, or extremely dry climates, both hot and cold, and is free from damage in all freezing weather; neither expands nor contracts with heat and cold, eliminating expensive precautions. Can be laid on ground surface or buried without danger. Delivers water as pure as at source of supply.

Canadian White Pine—Selected, best quality. No corrosion; lower labor, installation and maintenance costs; long life; no electrolysis, contamination of water, or destruction by sulphur, salt water or other mineral impurities. Can be laid in wettest kind of trench; elasticity of wood prevents bursting.

Hard Maple—No corrosion; lower labor, installation and maintenance costs; no electrolysis, or destruction by sulphur. Best for flushing culm ashes and other abrasive substances in hard coal mines.

Redwood and Cypress—Cypress is known as "the wood eternal." These are the best known casings or coverings for underground wood pipe carrying steam or hot water. Unaffected by moisture, insects, etc.; in fact, generally famous for their great age.

Wyckoff Wood Stave Pipe

A. WYCKOFF & SON COMPANY are originators of machine-made wood stave pipe.

Uses—When normal or constant pressure does not exceed 172 lb.; for a supply main, from source of supply; penstocks; for carrying water highly charged with acids; for carrying heavy fluids, pulps, brine, diluted sulphuric, nitric, muriatic acids, etc.

Construction—Made from woods listed above. All staves are double tongued and grooved, with faces planed, under close inspection. Staves are wound with flat bronze bands, solid hard drawn copper wire, gal-

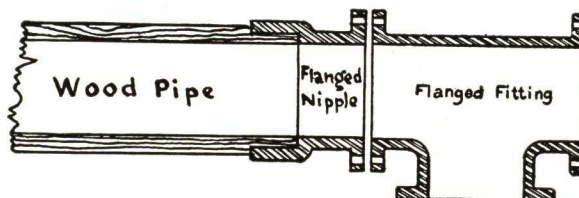
vanized wire or flat copper-steel bands at desired uniform tension. Pipe is rendered watertight by squeezing tongues into grooves. Montezuma asphalt coating is used as protection to the bands, or pipe can be painted with special acid resisting paint.

Sizes—Made in all sizes, for pressures up to and including 172 lb. per sq. in. Maximum pipe lengths, 12 ft.; shorter lengths permit pipe to be laid on curves without iron fittings.

Durability of Wood Pipe—Wooden pipe has done efficient service for years in connection with supply lines, mine drainage, hydraulic lines, hydro-electric plants, sewage lines, conduits, etc. Pipe in use for scores of years still show perfect condition.

Joint Fittings—The Company is prepared to furnish cast iron or any kind of fittings for connecting wood and metal pipes.

Wooden crosses, tees and ells in sizes up to 10-in. diameter are also available. These are made by properly boring heavy blocks cut from square timbers.

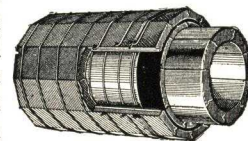


Method of Attaching Flange Fitting

Cost of Laying Wyckoff Pipe—Cost of laying is much less than that for cast iron pipe. No special labor or materials needed in making joints. Its lightness permits easy laying.

Wyckoff Improved Steam Pipe Covering

This covering is built of redwood or cypress "the wood eternal." The inner shell of 2 in. and outer shell of 1 in. with $\frac{1}{4}$ -in. dead air space between, has proved to be the best known protection for underground steam and hot water pipes. The asphaltum packing placed between the shells on the ends of each length and the driven joint make it watertight.

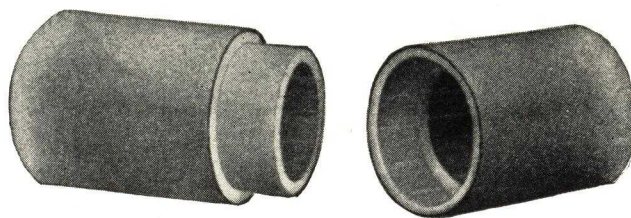


Improved Steam Pipe Covering



Wood Stave Pipe

Protective coating omitted from pipe to show steel bands. Note double winding at end



Two Ends of Wood Pipe

Tenon and socket joints of wood pipe that will stand a pressure of 160 lb. per sq. in. by simply driving them together

CONNERY & COMPANY, INC.

Second and Luzerne Streets, PHILADELPHIA, PA.

NEW YORK OFFICE: 501 Fifth Avenue

Products

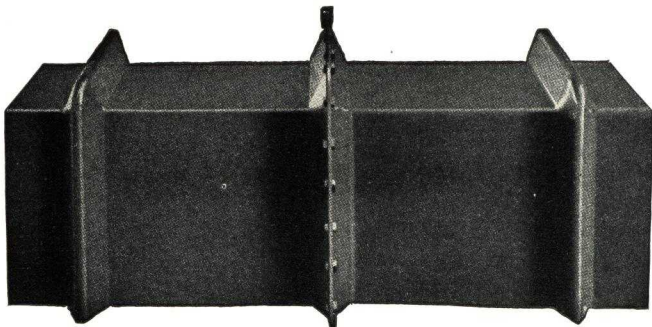
GENERAL STEEL PLATE CONSTRUCTION—Connery's Improved Expansion Stiffener; Connery's Improved Stack Connection; Connery's Adjustable Covering Clip; Boiler Breechings; Uptakes; Air and Preheater Ducts.

Slogan

"No job too small—none too distant."

Connery's Improved Expansion Stiffener (Patented)

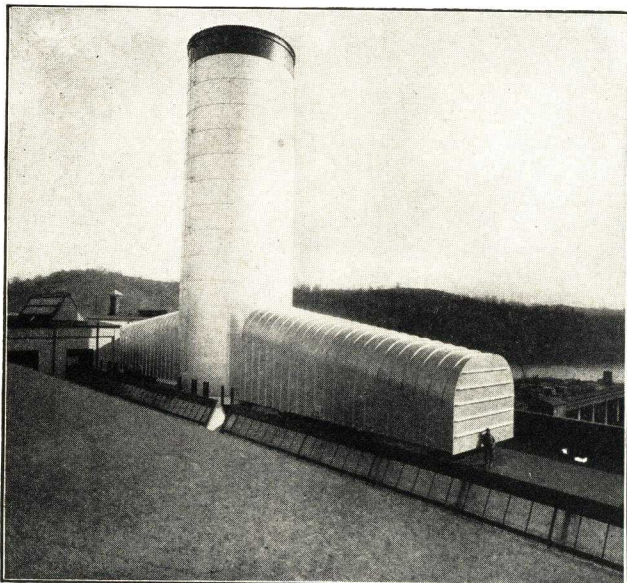
Consists of a "V" shaped projection pressed into the sheets, i.e., combining the bellows principle, the most feasible construction known to provide for expansion and contraction. Electrically welded at all corners and laps, making it airtight and moisture-tight—prevents internal corrosion and increases efficiency of draft. By virtue of its shape, it is heated equally at all points, providing maximum contraction and expansion.



Section of Flue Showing Improved Expansion Stiffener

Costs no more than other types of construction hitherto used; provides ample and uniform reinforcement, being many times stronger than any structural member of equal size.

Awarded Gold Medal at Sesqui-Centennial International Exposition, Philadelphia, 1926.



One of Four Sets of Breechings, Etc., Manufactured and Erected for Ohio Power Co., Philo, Ohio

Connery's Improved Stack Connection

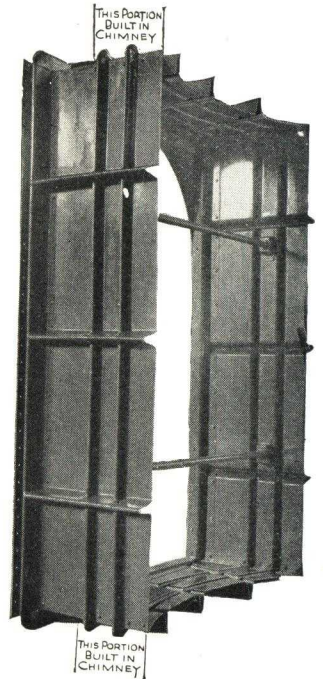
A rigid, electrically welded steel form with "V" shaped expansion stiffeners. Used for connecting the breeching to the stack, thereby eliminating the necessity for other prepared forms while building a concrete or brick stack.

This connection provides for expansion both vertically and horizontally, and when grouted in the stack forms a seal that eliminates any leakage at the stack opening.

A "U" shaped flexible copper joint may be added if desired to provide for stack movement.

Design of Elbows in Duct Systems

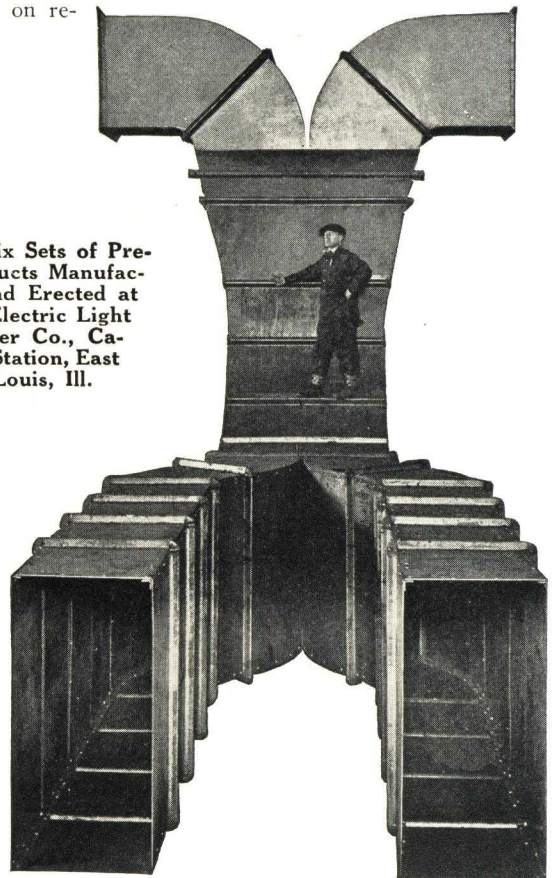
Prior to recent research work by the General Electric Company it was generally believed that ducts with rounded elbows had less velocity head loss than those with square corners. The contradiction of this theory and added knowledge of duct design will be found in "New Data for the Design of Elbows in Duct Systems" by Loring Wirt—a copy of which will be furnished on request.



Connery's Improved Stack Connection

Right:

One of Six Sets of Preheater Ducts Manufactured and Erected at Union Electric Light & Power Co., Cahokia Station, East St. Louis, Ill.



DOWNINGTOWN IRON WORKS

Tanks, Boilers and Steel Fabrication
Pioneers in Chrome Iron Construction

OFFICE AND WORKS
DOWNINGTOWN, PA.

NEW YORK OFFICE: 30 Church Street

Products

STEEL PLATE FABRICATION of every type for all purposes, of ordinary carbon steel, Chrome Iron and Chrome-nickel Alloys; Nickel Clad Steel, "Everdur," Aluminum, Monel Metal, etc.

A few of the principal items we are making regularly:

Acid Tanks; Air Pressure Tanks; Blow-off Tanks; Brine Tanks; Elevator Tanks; Filter Tanks; Fuel Oil Tanks; Galvanizing Tanks; Grease Tanks; Jacketed Tanks; Pressure Tanks; Rendering Tanks; Blast Piping; Breechings; Coal Bins; Calandrias; Gas Pipe; Hoppers; Hydraulic Mains; Lime Kilns; Oil Stills; Pontoons; Riveted Pipe; Steel Stacks, Buoys.

Downingtown Quality

The idea of quality has always been kept in the foreground. Right material, good design, careful workmanship is the sound basis on which we have built. We have adhered to this policy—never has the need for business or low price conditions even tempted us to deviate from this established standard. As a result, Downingtown is recognized as representing a high standard of workmanship, and users of Downingtown tanks and other plate work have no regrets.

Facilities

DOWNINGTOWN IRON WORKS is advantageously located. Near enough to the big steel plate production centers to permit an intimate and personal contact with the mill men, we have certain advantages in getting prompt and co-operative service on raw material. We have excellent railroad service—this helps in getting raw materials in and facilitates outgoing shipment. Downingtown is located on the main line of the Pennsylvania R. R. to points west.

Our plant is equipped with every mechanical facility for economical execution of all operations in fabrication.

Methods and Engineering Service

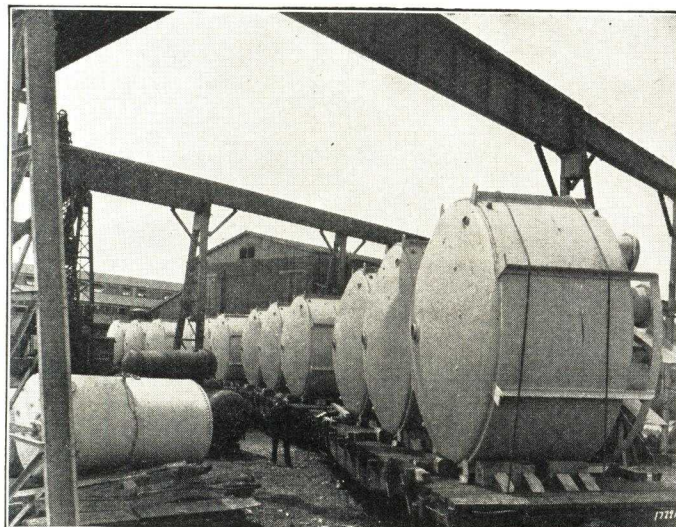
We are prepared to handle any problems in the design and fabrication of riveted and welded steel plate construction. In the many special problems encountered in this class of work, our engineers, trained and experienced, are available for consultation and design service. Fabrication also covers special designs to the purchaser's specifications; and we do certain classes of erection work in the field.

Hartford Steam Boiler Inspection and Insurance Company has "approved" Downingtown's procedure to build Arc-Welded A.S.M.E. unfired pressure vessels, of classes 2 and 3—in shell thickness up to and including 1¼-in.

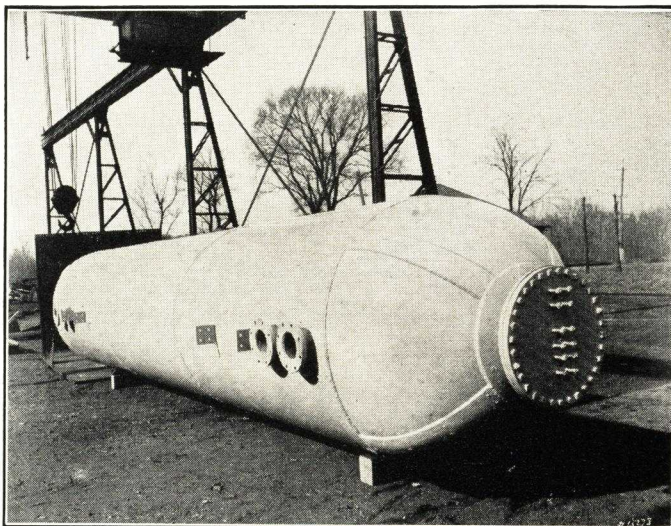
Chrome Iron, Chrome Nickel Alloys, Nickel-clad Steel

The physical and chemical characteristics of chrome iron, chrome nickel iron, and nickel clad steel, are such that only an experienced group of fabricators working with a modern and properly equipped shop can fabricate it into satisfactory products. The DOWNINGTOWN IRON WORKS are pioneers in this field, and are fully equipped to handle any problem of construction. In addition, they have the services of Dr. T. H. Nelson, one of the leading authorities on chrome iron fabrication in America, to assist in working out various problems met with in connection with modern steels.

DOWNINGTOWN IRON WORKS also publishes the "Downingtown Doings," an illustrated booklet containing informative articles, and dealing with modern trends in the steel plate industry. Your copy will be sent regularly upon request.



Several Carloads of Welded Vessels for One Installation in the Chemical Industry



A Welded Pressure Separator 6 Ft. x 33 Ft., of 5/8-in. Steel. An Export Job by Downingtown

GRAVER TANK & MFG. CORP.

Manufacturers, Designers and Erectors of Steel Tanks, Steel Plate Construction; Water Treating Equipment

GENERAL OFFICES AND PLANT
4130 Todd Avenue, EAST CHICAGO, IND.

REPRESENTATIVES IN ALL INDUSTRIAL CENTERS

Products

STEEL PLATE CONSTRUCTION: Special steel plate industrial apparatus of every description designed, fabricated and erected anywhere complete with fittings. **HIGH PRESSURE and SPECIAL REFINERY EQUIPMENT:** Agitators, Run-down Tanks, etc. **REFINERY and FIELD STORAGE** for crude oil, natural gasoline and other liquids of high volatility. Refinery storage designed with "Floating Roofs." **BULK and SERVICE STATION STORAGE and EQUIPMENT** built and installed complete. **GRAVER VAPOR SAVING PROCESS** in connection with storage of petroleum products. **SPECIAL INDUSTRIAL PLANT EQUIPMENT** including Gas Holders, Dust Collectors, Hot Stoves for steel mills, Special Pressure Tanks, Coal Hoppers, Sand Bins, Ovens, etc.

SPECIAL STEEL PLATE APPARATUS of every description for the process industries and for power utilization and generation.

STORAGE EQUIPMENT COMPLETE built and erected, for liquid, semi-liquid or dry materials. **BREWERY TANKS** of all specifications.

Also **Water Treating Equipment** including Filters, Softeners and Purifiers. **Iron Removal Filters.** **Swimming Pool Filters** and **Recirculating Equipment.** **Household Water Softeners.** Special bulletins available. See Sweet's Architectural Catalogues.

GRAVER

Organization and Facilities

Three-quarters of a century of experience in special steel construction has built a "dependability record" for Graver Products. It is a record of quality manufacture and of service by a capable organization. This long experience has shown the plain road to economy and efficiency in manufacture and leads to reasonable costs.

Graver facilities are complete for the fabrication of special steel plate products on any scale, and for their installation complete, *anywhere*. A highly skilled personnel of artisans and operators—special welding and riveting methods, careful testing, high standards in mechanical processes—lead always to satisfactory performance and to the Graver Guarantee that materials and workmanship in every instance will comply with blueprints and specifications.

Investigation of Graver processes and workmanship, as well as discussions of requirements, are invited. Estimates and proposals are solicited—large or small—based on either the buyer's designs or on Graver recommendations.

Certain standard sizes of Graver vertical and horizontal tanks are available for immediate shipment.

GRAVER STEEL PLATE CONSTRUCTION—TYPES AND USES

CONTAINERS FOR STORAGE

LIQUID CONTAINERS (ANY SHAPE)

Capacities—100 gallons to 120,000 barrels.

For storing—

Acids	Cottonseed Oil	Paint	Syrup
Ammonia	Creosote Oil	Varnish	Turpentine
Alcohol	Fuel Oil	Vinegar	Water
Beer	Gasoline	Soap Liquids	Etc.
Chemicals	Oils (Petroleum)		

Fittings—All necessary fittings.

SEMI-LIQUID CONTAINERS (ANY SHAPE)

Capacities—Any capacity.

For storing—

Asphalt	Fats, Soap Stock	Lard	Tallow
Beet Sugar Syrup	Glycerine	Mash	Tar
Blackstrap Molasses	Graphite	Paraffin	White Lead
Fats, Animal	Grease	Soap	Etc.

Fittings—Flanged connections for piping, manhead openings, special fittings as required, steam coils for heating where required.

DRY CONTAINERS (ANY SHAPE)

Capacities—Any capacity.

For storing—

Ashes	Crushed Stone	Lime	Seeds
Barley	Dry Cement	Malt	Soda Ash
Coal	Fertilizer	Ores	Starch
Coal Dust	Fuller's Earth	Quartz	Sugar
Coal Briquettes	Grain	Salt	Etc.
Coke	Gravel	Sand	

Fittings—Manhead openings, hopped outlets, spouts, gates, etc.

COMPRESSION CONTAINERS (CYLINDRICAL) VERTICAL OR HORIZONTAL

Capacities—Horizontal—From 24-in. diameter to 25-ft. diameter. From 24 in. in length to 120 ft. in length.

Vertical—From 24-in. diameter to 35-ft. diameter. From 24 in. high to 100 ft. high.

For storing—

Gas or Compressed Air.
Liquids and Semi-Liquids under pressure.

Fittings—Flanged connections for piping, manhead openings, pressure gauges, all special fittings.

GAS HOLDERS

Capacities—Single lift holders.

For storing—

Illuminating Gas	Acetylene Gas
Fuel Gas	Etc.

Fittings—All necessary fittings.

PROCESS EQUIPMENT

Capacities—As required.

Equipment—

Agitators (Paint and Mixing)	Gas Scrubbers
Agitators (Refinery)	Jacketed Kettles (Steam)
Annealing Boxes	Oil Refining Equipment
Annealing Pits	Oil Steam Stills
Brew Kettles	Oil Stills (Externally Fired)
Cement and Lime Kilns	Pressure Stills
Creosoting Cylinders	Rendering Tanks
Creosoting Stills	Soap Frames
Crude Oil Stills	Soap Kettles
Dryer Shells	Steel Shells
Dust Collectors	Stills (All Types)
Filters (Water)	Tempering Tanks
Fractionating Towers	Vacuum Oil Stills
Gas Purifiers	

Fittings—Flanged connections for piping, integral piping, manhead openings, hand holes, pressure gauges, heating coils, agitating devices, special fittings as required.

MISCELLANEOUS WORK

Capacities—All capacities, sizes and shapes.

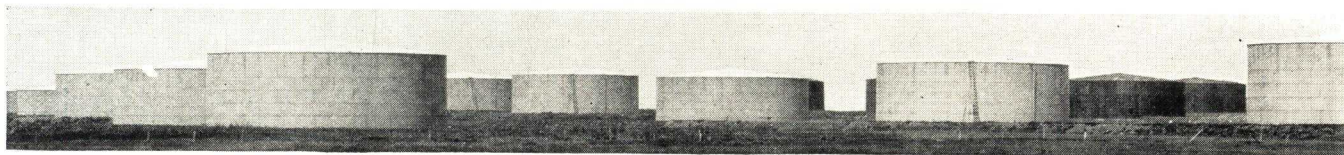
For—

Blast Furnace Piping	Gas Piping (Riveted or Welded)
Blast Furnace Hot Stoves	Ice Tanks
Balloon Flues	Locomotive Tender Tanks
Breechings	Penstock Bells (Discharge)
Car Tanks	Penstock Headers
Condenser Boxes	Pontoons
Conduits	Smoke Hoods
Dredge Hulls	Stacks (Guyed and Self-supporting)
Dredge Piping	Steel Barges
Expansion Joints (Steel Plate)	Vacuum Tanks
Gas Flues (Riveted or Welded)	Etc.

Fittings—Fittings and accessories as required.

BULK AND FILLING STATION TANKS AND EQUIPMENT

Complete bulk storage plants for the storing and handling of gasoline and other petroleum products as used by distributors. The service consists of designing and furnishing all buildings and equipment for complete plants. Bulk Station Equipment Catalog sent on request.

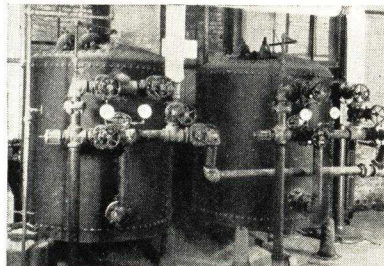


Large Capacity Field Storage Tanks for the Petroleum Industry



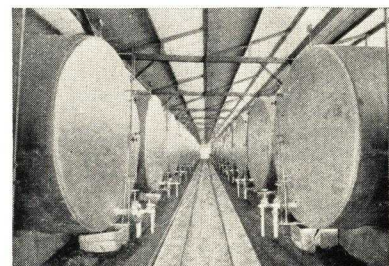
Brewery Tanks

Fabricated to the designs and specifications of Freyn Engineering Company, Chicago



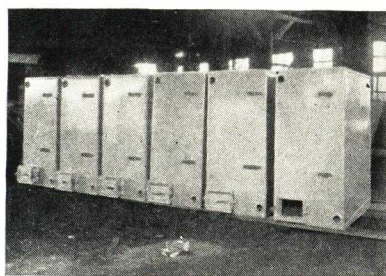
Water Purifying Equipment

Swimming pool in the Executive Mansion, Albany, N. Y.

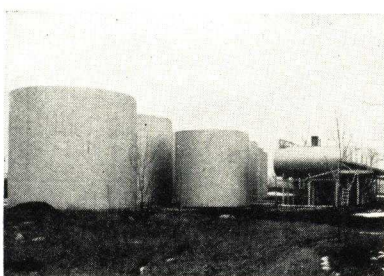


Series of Storage Tanks

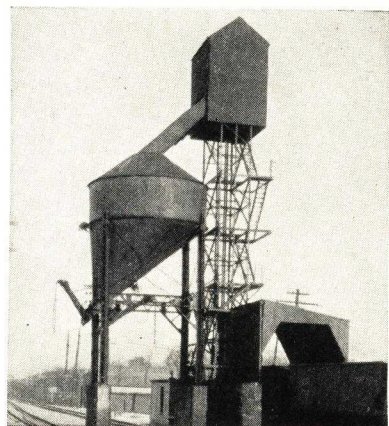
In connection with a large refinery



Tanks Employed in the Preparation of Varnish



Bulk Storage Plants for Motor and Fuel Oils and Gasoline



Specially Fabricated Railway Coal Hopper

GRAVER STANDARD STEEL TANKS—RIVETED OR WELDED

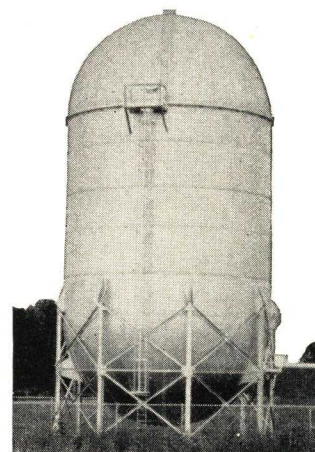
Field Erected Tanks			Horizontal Tanks (Aboveground)			Vertical Tanks		
Size	Capacity, barrels	Weight, lb.	Size	Capacity, gal.	Weight, lb.	Size	Capacity, barrels	Weight, lb.
15'9" x 21' 3 3/4"	740	14160	10'6" x 11'11"	7719	6450	10'6" x 12'7"	8151	5200
21' x 9' 8 3/4"	600	13500	10'6" x 15'7"	10094	7800	10'6" x 15'7"	10094	5900
21' x 19' 3 3/4"	1177	19000	10'6" x 18'5"	11930	8850	10'6" x 18'5"	11930	6600
26'3" x 9' 9"	940	18700	10'6" x 23'7"	15275	10700	10'6" x 23'7"	15275	8050
26'3" x 17' 7"	1695	24200	10'6" x 26'5"	17110	11750	10'6" x 24'11"	16140	8500
26'3" x 23' 5"	2257	28700	10'6" x 29'5"	19054	12900	10'6" x 26'2"	16950	8850
26'3" x 24'11"	2402	30000	10'6" x 32'3"	20889	13900	10'6" x 28'3"	18299	9400
36'9" x 27' 3"	5148	51650	10'6" x 38'1"	24667	16050	10'6" x 30'1"	19487	9850
47'3" x 32' 1"	10020	82800	10'6" x 46'11"	30388	19200	10'6" x 31'5"	20350	10500
63' x 27' 3 1/2"	15162	116600	11' x 14' 6"	10300	7850	11' x 14' 6"	10300	5850
78'9" x 29' 5 1/2"	25538	196200	11' x 17' 4"	12320	9000	11' x 17' 4"	12320	6680
94'6" x 30' 4 1/2"	31944	288000	11' x 21' 5"	15225	10850	11' x 21' 5"	15225	7900
117'2 1/2" x 29' 5 3/4"	56360	400000	11' x 24' 3"	17240	11600	11' x 24' 3"	17240	8650
117'2 1/4" x 41'10"	80075	571000	11' x 27' 3"	19370	12700	11' x 27' 3"	19370	9500
			11' x 30' 1"	21386	13950	11' x 30' 1"	21386	10500
			11' x 33' 1"	23637	14950	11' x 33' 1"	23637	11300
			11' x 35'11"	25535	16270			
			11' x 41' 9"	29680	18500			
			11' x 48' 3"	34300	21000			

The weights given are for tanks made of 1/4" plate. Lighter or heavier plate can be furnished when desired.

Note: All types of tank are available in the intermediate and smaller sizes.

All sizes built of 1/8" steel plate throughout.

Specially Fabricated Railway Coal Hopper



High Pressure Gas Storage Tank

Graver-built Equipment Is Correctly Designed—and Safe

In designing and building of special steel plate construction, three generations of experience have paved the way to unusual efficiencies in manufacture. The name "Graver," in connection with industrial equipment, is synonymous with dependability, an assurance of complete satisfaction at a most reasonable cost.

Not only is this true of Graver-built special equipment for industrials generally, but particularly so for the petroleum industry. In this field Graver has had an unusual experience matching, by the development of special equipment, every advance in the handling, refining and storage of petroleum products.

For example: Special refinery storage designed with floating roofs—a safety feature that prevents losses. Also: stills, towers, condensers, agitators and run-down tanks. High pressure storage equipment for the safe and correct storage of natural gasoline, casing head gasoline and other liquids of high volatility. Refinery and field storage erected complete.

Complete Bulk and Service Station Storage built and installed clear to the last details of testing and placing in operation—all of it Guaranteed by Graver.

Also Water Treating Equipment, Graver-built and installed. For filtering, softening and purifying water—household, swimming-pool, industrial and municipal installations.

Catalogues and Bulletins on the various types of Graver Special Equipment sent on request.

LANCASTER IRON WORKS, INC.

Tanks and Steel Plate Products
Pattern, Foundry and Machine Work
West Hager Street, LANCASTER, PA.

NEW YORK, N. Y., 370 Lexington Avenue

PHILADELPHIA, PA., 2222 Land Title Building

Products

We design, fabricate and erect Steel Plate work of every description, gas or electric welded, riveted or both riveted and welded as follows:

STEEL OR ALLOY TANKS—Any shape, any size—for Power Plants, Breweries, etc. For the storage of Gasoline, Oil, Chemicals, Acids, Water, Molasses, etc.

POWER HOUSE EQUIPMENT including Blow Cases, Breechings, Bunkers, Flues, Bins, Hoppers, Penstocks, Stacks, Steel Pipe—riveted or welded.

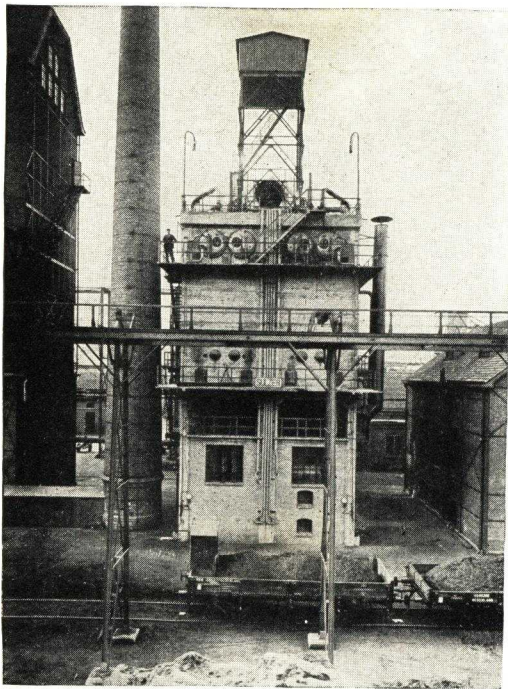
PRESSURE VESSELS—Air Receivers, Autoclaves, Digesters, Steam and Vacuum Stills. Also specially designed equipment for pressure work under varying temperatures.

DREDGING EQUIPMENT—Dredge Pipe, Elbows, Gate Valves, pontoons, Steel Barges, Caissons, Dredge Hulls, Accessories.

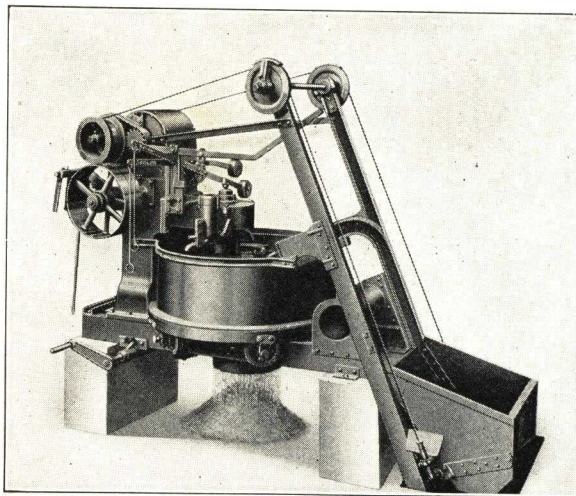
CHEMICAL and OIL REFINERY EQUIPMENT—Agitators, Condensers, Evaporators, Rotary Filters and Dryers, Kiers, Mixers, Jacketed Kettles, Retorts, Stills and Towers.

STAINLESS STEEL or HIGH CHROME ALLOY PRODUCTS—for resisting corrosion, such as: Nitric Acid Towers, Condensers, Drums, Heat Exchangers, Tanks.

BRICK MACHINERY.
LANCIRICK MIXERS.



Coke Quenching Apparatus (Sulzer Process)



The Lancirick Mixer

Service and Facilities

We have our own machine shops, unusually well equipped, together with foundry and pattern shop in addition to two large plate shops. These facilities are backed by a competent technical staff and an experienced shop personnel.

Only the highest grades of iron, steel and other materials are used—unless otherwise specified.

With a well-trained organization, experienced shop personnel, competent field crews and convenient railway facilities, we are always ready to handle your wants without delay.

Estimates will be furnished promptly.

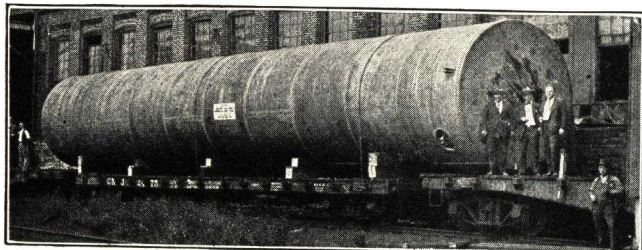
The Lancirick Counter Current Rapid Batch Mixer

The Lancirick Counter Current Rapid Batch Mixer, shown at the left, is a perfect mixing system because

(1) It will improve your present mixing results through perfect distribution of components; or

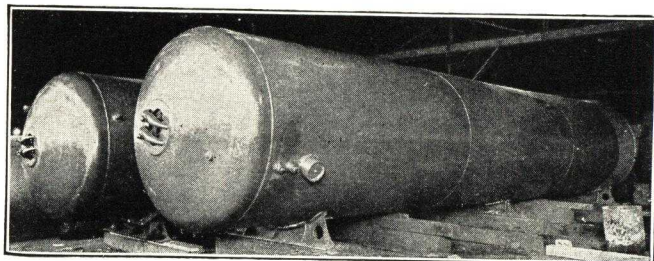
(2) It will deliver the same results as your present equipment in less mixing time.

Further information on request.



Nitric Acid Absorption Tower

One of many chromium iron jobs fabricated by us annually



Gas Welded Pressure Vessels, 7 Ft. Diam., 38 Ft. Long

Tested to three times the working pressure to insure absolute tightness under severe operating conditions

PITTSBURGH-DES MOINES STEEL COMPANY

Steel Tanks, Towers, Plate Construction, Structural Steel

3430 Neville Island, PITTSBURGH, PA.

SALES OFFICES

NEW YORK, N. Y., Room 930, 270 Broadway
CHICAGO, ILL., 1234 First National Bank Building
DES MOINES, IOWA, 931 Tuttle Street

SAN FRANCISCO, CAL., 637 Rialto Building
SEATTLE, WASH., 3138 L. C. Smith Building
DALLAS, TEX., 1235 Praetorian Building

SHOPS: PITTSBURGH, PA. and DES MOINES, IOWA

Products and Services

Steel Products—ELEVATED TANKS, STAND-PIPES and STEEL RESERVOIRS for municipal, industrial, institutional and railroad water storage and fire protection; STORAGE TANKS for oil, water, molasses, acids and other liquids; SURGE TANKS; RIVETED or WELDED PIPE and PENSTOCKS; PRESSURE GAS HOLDERS, either spherical or cylindrical; BINS of all sizes and shapes; SMOKESTACKS; GENERAL PLATE FABRICATION; GRANDSTANDS; HIGHWAY and RAILROAD BRIDGES; RADIO and WIRELESS TOWERS; AIRPLANE HANGARS and MILL BUILDINGS.

Other Materials—Also Tanks and Containers of IRON, STAINLESS STEEL, ALLOYS, EVERDUR and ALUMINUM.

Municipal Incinerators and Water Works—Designers and Constructors of MUNICIPAL GARBAGE and REFUSE INCINERATORS; MUNICIPAL and PRIVATE WATER WORKS and WATER TREATING PLANTS.

Elevated Steel Tanks



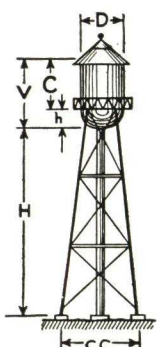
An elevated steel tank provides an efficient and economical way of storing water at an elevation high enough to give sufficient pressure for water supply and fire protection or for a sprinkler system.

Pittsburgh-Des Moines standard tanks are carried in stock for immediate shipment in capacities ranging from 25,000 to 100,000 gallons. Other standard tanks range from 5,000 to 2,000,000 gallons. Standard towers

available in heights to suit any requirement, using either vertical or battered columns.

Hemispherical Bottom Tanks—Following is table of dimensions of standard hemispherical bottom tanks.

DIMENSIONS OF STANDARD
HEMISPHERICAL BOTTOM
TANKS AND TOWERS



Note: Distance center to center of adjacent columns (c.c.) is $.707D + .2(H + \frac{1}{2}D) + 1\frac{1}{2}$ ". The length of one side of the square plot of ground required may be determined roughly by adding 10 ft. to the above formula.

Capacity in U. S. gals.	Range of head (V), ft. in.	Diam- eter (D), ft.	H
5,000	10 0	9	
10,000	11 11	13	
15,000	16 11	13	
20,000	21 11	13	
25,000	19 11	15	
30,000	23 9	15	
40,000	25 1	17	
50,000	25 7	19	
60,000	30 6	19	
75,000	30 6	21	
100,000	31 0	24	
150,000	34 7	28	
200,000	36 1	32	
250,000	45 4	32	
300,000	42 5	36	
400,000	46 6	40	
500,000	49 2	44	
600,000	58 2	44	
*750,000	42 4	60	
*1,000,000	50 0	73 $\frac{3}{4}$	
*1,500,000	50 0	79	
*2,000,000	50 0	90 $\frac{1}{4}$	

*Note: These are hemi-ellipsoidal bottom tanks.

Hemi-Ellipsoidal Bottom Tanks—A series of elevated tanks ranging from 25,000 to 2,000,000 gallons, affording a lower range of head than hemispherical bottom tanks, usually found desirable in larger capacities only.



Steel Storage Tanks

Standpipes and Reservoirs—For water storage, either low head large diameter or high head



small diameter; with or without roof; of riveted or welded construction. These may be built any size or capacity. Our standard sizes are as listed in the following table:

Field Erected Storage Tanks—For gasoline, oil, molasses, acids, and other liquids; of any capacity up to 140,000 barrels, of either riveted or welded construction.

Shop Assembled Storage Tanks—For gasoline, oil, or other liquids; for bulk oil stations, service stations, or other purposes; of welded or riveted construction; up to 10 ft. 6 in. diameter and 30,000 gallons.

STANDARD RESERVOIR SIZES

Capacity in U. S. gals.	Diameter ft. in.	Height ft. in.
50,000	24 0	15 1
75,000	24 0	22 6 $\frac{1}{4}$
100,000	30 0	19 3
125,000	30 0	24 0
150,000	36 0	20 0 $\frac{1}{4}$
175,000	36 0	23 3 $\frac{3}{4}$
200,000	36 0	36 7 $\frac{3}{4}$
300,000	42 0	29 3 $\frac{1}{4}$
400,000	42 0	39 0 $\frac{3}{4}$
500,000	48 0	37 4 $\frac{1}{2}$
600,000	60 0	28 9 $\frac{1}{4}$
750,000	72 0	24 11 $\frac{7}{8}$
1,000,000	84 0	24 5 $\frac{3}{4}$
1,500,000	96 0	28 0 $\frac{7}{8}$
2,000,000	120 0	23 11 $\frac{7}{8}$
2,500,000	132 0	24 9 $\frac{1}{4}$
3,000,000	144 0	24 11 $\frac{3}{4}$
4,000,000	168 0	24 5 $\frac{3}{4}$

Gas Holders

Spherical or cylindrical containers for gas or volatile liquids; field erected or shop assembled; of riveted or welded construction; of any size required.

Steel Plate Fabrication

Riveted or Welded Pipe or Penstock—20 inches or larger in diameter, for any pressure.

Bins—Rectangular or cylindrical; with flat, spherical or conical bottom; supported on columns or directly on foundation; of any size for any purpose.

Steel Grandstands—Made in standard units which may be added to at any time.

Miscellaneous—Smokestacks, hot blast stoves, kettles, cookers, refinery equipment.

Structural Steel Fabrication

Bridges—Designed, fabricated and erected.

Radio and Wireless Towers—For the support of antennae wires or to act as vertical antennae.

Airplane Hangars and Mill Buildings—Designed and erected, or fabricated from plans.

Municipal Garbage and Refuse Incinerators

We will design and build, under rigid guarantee, incinerators of capacity ample to take care of requirements of a community of any size.

McCLINTIC-MARSHALL CORPORATION

Subsidiary of Bethlehem Steel Corporation

Structural Steel Fabrication and Erection and Steel Plate Construction

GENERAL OFFICES
BETHLEHEM, PA.

DISTRICT OFFICES

NEW YORK
39 Broadway

BOSTON
75 Federal Street

BUFFALO
Bell and Abbey Streets

CLEVELAND
Terminal Tower

SAN FRANCISCO
20th and Illinois Streets

PHILADELPHIA
Broad Street Station Building

CINCINNATI
Union Trust Building

ST. LOUIS
Telephone Building

BALTIMORE
Mercantile Trust Building

DETROIT
General Motors Building

LOS ANGELES
11100 South Central Avenue

PITTSBURGH
Oliver Building

CHICAGO
Wrigley Building

EXPORT DISTRIBUTOR: Bethlehem Steel Export Corporation, 25 Broadway, NEW YORK, N. Y.

Products and Services

Bridges—Ore Bridges; Trestles; Bridges of every design for any industrial use.

Buildings—Mill, Factory and Industrial Buildings; Power Plants; Machine Shops; Foundries; Pier and Train Sheds; Freight Depots and Terminals; Warehouses; Steel Frame Buildings of all descriptions.

Gas Plant Equipment—Gas Holders; Pressure Holders; Gas Purifiers, Scrubbers and Condensers.

Oil Refinery and Chemical Plant Equipment—Petroleum Refining Plants; Gasoline Absorbers; Agitators; After-coolers; Autoclaves; Stills; Cylinders; Condensers; Dye Kettles; Nitrators; Scrubber, Bubble, Fractionating, Acid and Absorbing Towers; Crude, Naphtha, Gasoline and Acid Storage Tanks.

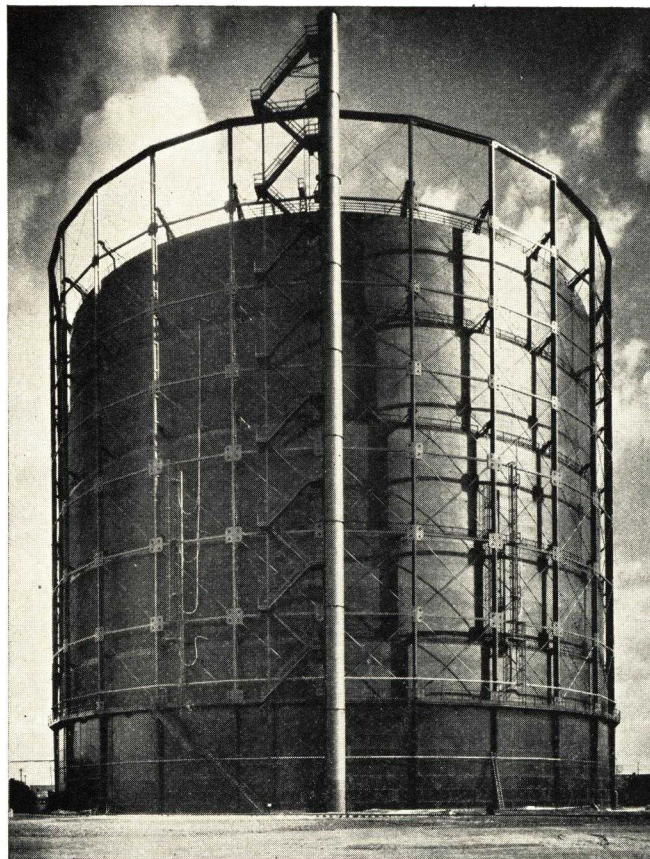


Pipe—Welded and Riveted Pipe; Flumes; Penstock.

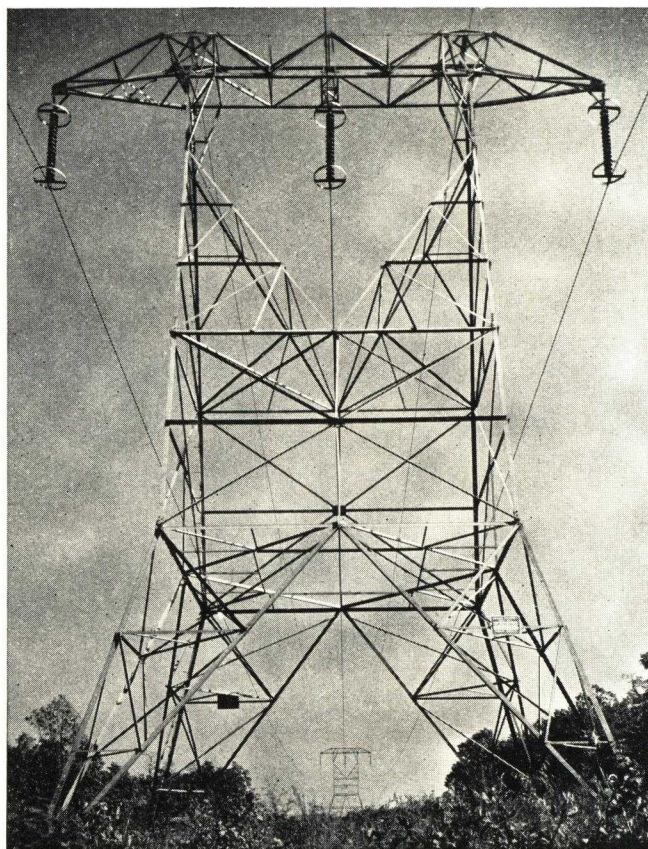
Steel Plate Work and Construction—Boxes; Bins; Boiler Breechings; Chimneys; Chutes; Creosoting Cylinders; Hydraulic and Steam Accumulators and Cylinders; Stationary and Rotary Digesters; Hoppers; Cement Kilns; Annealing, Drying and Evaporating Pans; Rotary Kilns and Dryers; Mixers.

Tanks—Tanks for Oil, Acid and all kinds of liquids; Elevated Water Tanks; Standpipes; Gasoline Station Tanks.

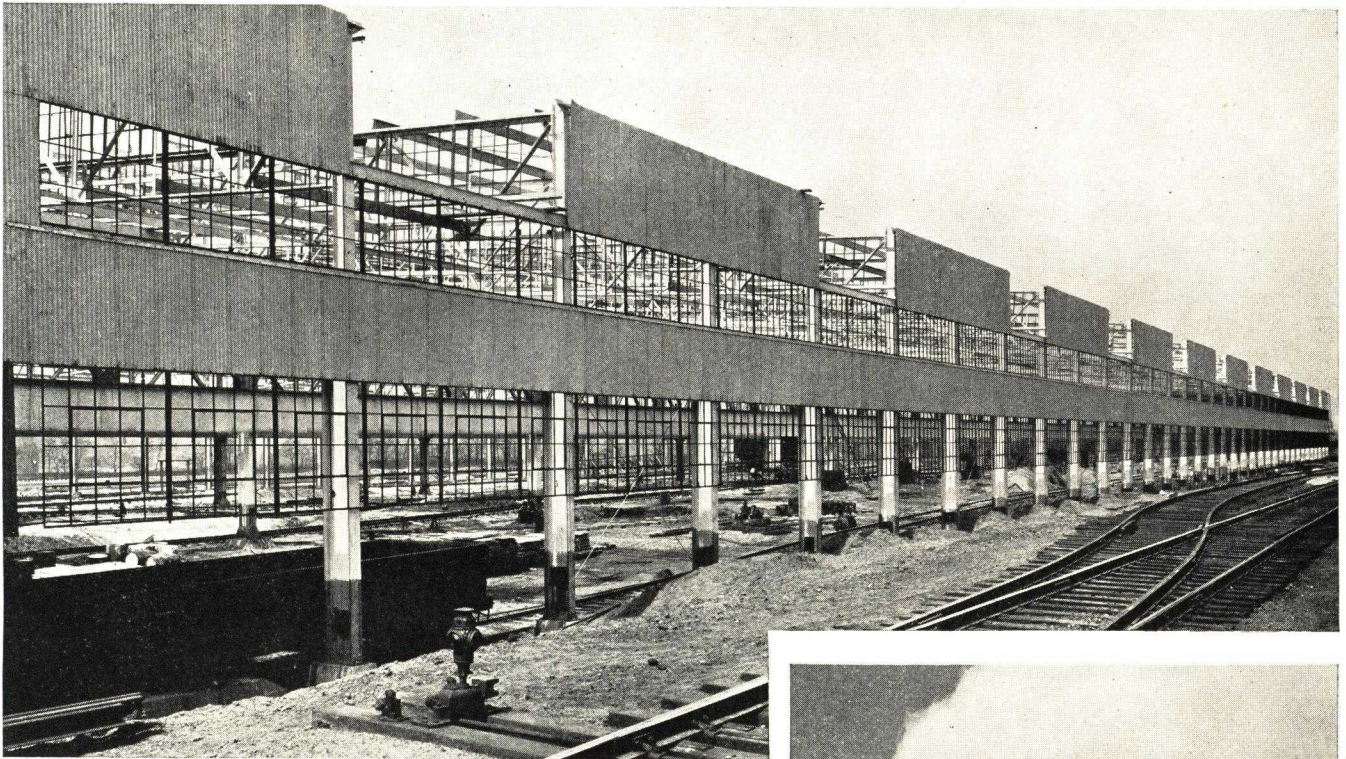
Towers—Transmission Poles and Towers; Radio Masts and Towers; Floodlight Towers; Water Cooling Towers.



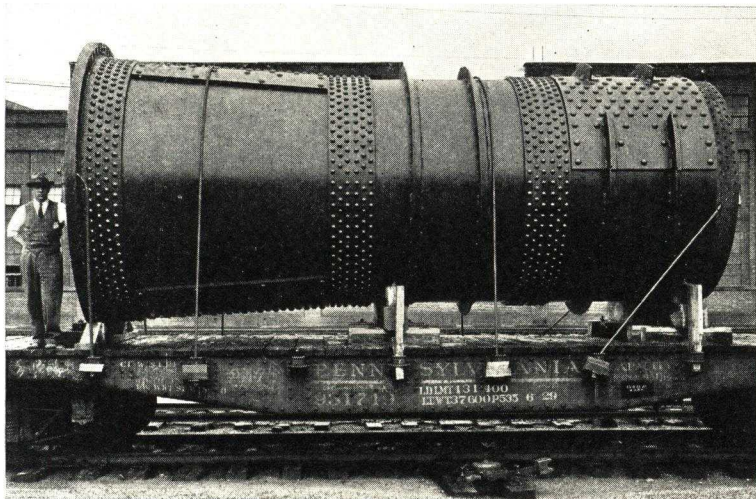
10,000,000 cu. ft. Gas Holder



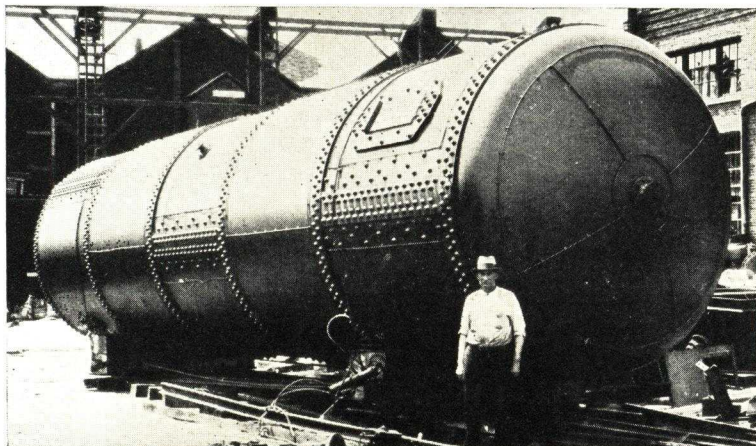
320 kv. Transmission Tower



Steel Frame Industrial Building



Riveted Heavy Penstock



Steam Accumulator Tank



Elevated Water Tank with Ellipsoidal Bottom

WALSH HOLYOKE STEAM BOILER WORKS, INC.

Steel Plate Construction
Riverside, HOLYOKE, MASS.

Products

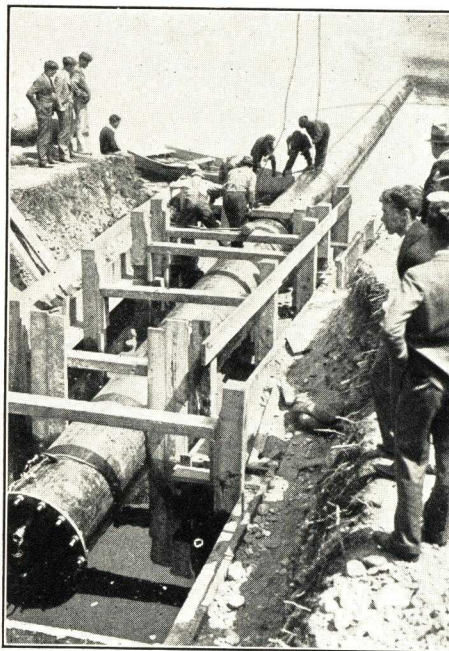
All classes of LIGHT and HEAVY STEEL PLATE CONSTRUCTION, including Riveted and Welded Tanks of every description for water storage, compressed air, acid, filters, rosin, size, heaters, blow-off, receiving, oil, caustic soda, brine, molasses, fuel oil and tar.

Diffusers, Digestors, Incinerators, Barking Drums for pulp mills.

Penstocks, Riveted Steel Pipe, Electrically Welded Pipes, Surge Pipes, Wheel Cases and Draft Tubes; Smokestacks, Flues, Rotary Bleach Boilers, Standpipes, Kiers, Flumes, Expansion Joints for pipe lines, Uptakes and Dampers for Boiler Tubes.

Steel Pipe (either Welded or Riveted) for water works, hot dipped, for bolted or flanged joints, or continuous riveting.

Special Tanks—Nickel Clad, Stainless Clad, Alloy or Bituminous, lined for storage of various liquids.



Welded Steel Intake Pipe with Dresser Couplings
City of Cambridge, Mass.

Facilities for Dipping and Electric Welding

We are particularly well equipped to furnish electric arc-welded pipe for water works. With our up-to-date equipment we are prepared to furnish steel pipe up to 36 ft. 0 in. in length without intermediate girth seams using either metallic arc or carbon arc. Our facilities for hot dipping or spraying protect this pipe against corrosion and insure long life. We have recently completed installations for Springfield, Metropolitan District Commission Worcester, Portland, New Haven, Hartford and others.

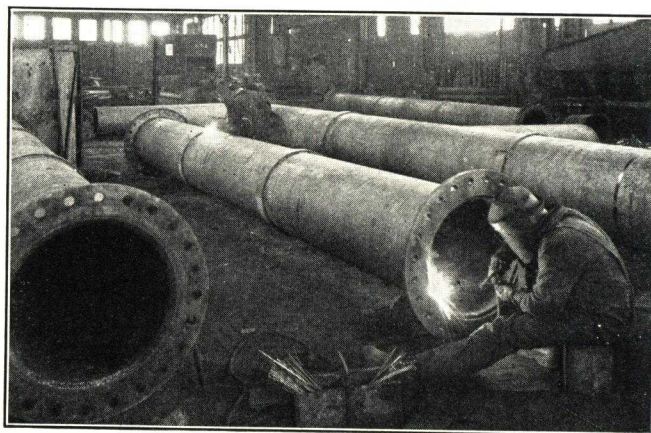
These machines can also be used for electric-welded tanks, penstocks, etc.

Electric Heat

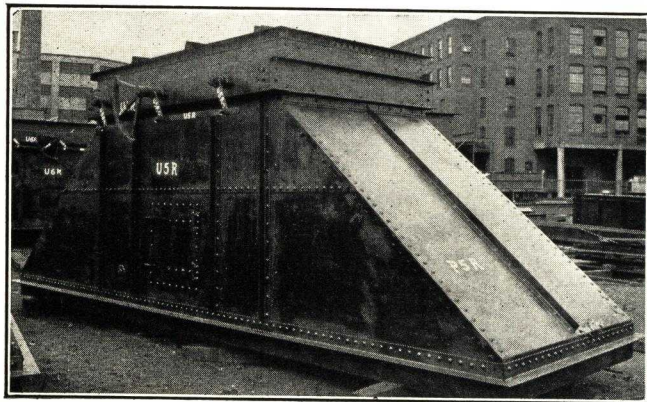
If you use steam or superheat in process work, let us know your problems. It is not unlikely that we can apply electric heat at a material saving.



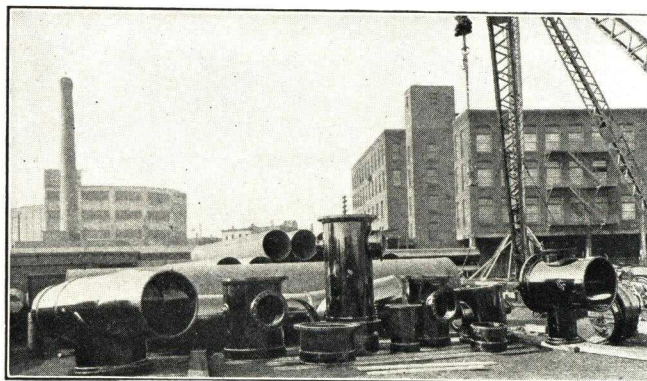
Portion of 20,000 ft. Water Line
City of Worcester, Mass.



Special Wrought Iron Water Line
New Haven Water Co., New Haven, Conn.



Uptake and Damper for Water Tube Boiler



Steel Valve Chambers Superseding Cast Iron

AMERICAN WATER SOFTENER CO.

Including by Purchase

THE NEW YORK CONTINENTAL JEWELL FILTRATION CO.

Mechanical Filtration and Water Softening Plants

320 Lehigh Avenue, PHILADELPHIA, PA.

Products and Services

WATER SOFTENING PLANTS of both Zeolite and Lime and Soda Types; complete FILTRATION SYSTEMS; PRESSURE and GRAVITY FILTERS.

Plants for removing iron from well and other waters, for neutralizing acidity, for elimination of tastes and odors and for removal of organic matter and discolorations; Water Sterilizing Apparatus; Mechanical Filter Equipment and Appurtenances; Subsidence Basins and Plants for applying coagulants and reagents to waters which are to be clarified, purified or softened.

This Company will make a Scientific Investigation of any Water Supply and will Recommend and Install Plants particularly designed and guaranteed to meet local conditions.

Swimming Pools—Refiltration

Having designed and furnished hundreds of refiltration systems this Company is prepared to investigate, make recommendations on design and to quote prices on equipment for swimming pools. Also to furnish equipment for proper chlorination of water. Such recirculating, refiltration and chlorinating systems obtain great savings in cost for water and, where pool waters are heated, in heating cost.

Zeolite Water Softeners

Especially adapted to those cases where water absolutely free from hardness is essential. Made in both closed pressure and open gravity types. Excepting for substituting a zeolite for sand and gravel these softeners are practically identical with filters as herein described. Maintenance of the zeolite's water softening properties is secured through periodic use of common salt.

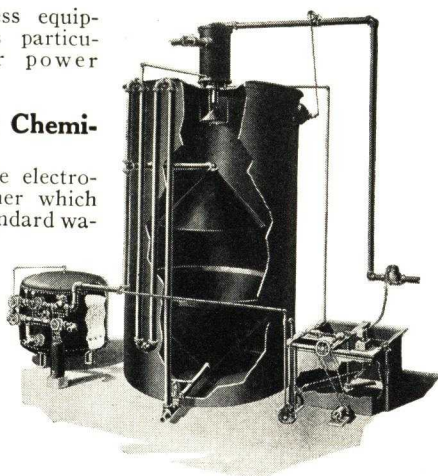
Lime-Soda Water Softeners

Manufactured in hot process, semi-hot process and cold process types, with excelsior or sand filters and top or completely ground operated. Used for the treatment of boiler feed water, water for ice making, or water for other municipal or industrial uses.

The hot process equipment illustrated is particularly suited for power plants.

Electro-Magnetic Chemical Feed

Operated by the electro-magnetic proportioner which is controlled by a standard water meter. Owing to its non-clogging feature is particularly suitable for feeding chemicals in solution or suspension for pH control to add either acidity or alkalinity. This feed is furnished with American Lime-Soda Softeners.



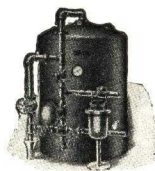
Hot Process Lime-Soda Water Softener

The New York Continental Jewell Filtration Company

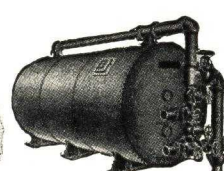
The AMERICAN WATER SOFTENER CO. having acquired the business of The New York Continental Jewell Filtration Co. can furnish filters as formerly supplied by that company, including the "New York," "Continental," "Jewell," "Warren," "Hyatt," "Blessing," "American" and "National" types.

Pressure Filters

Vertical or horizontal (of steel or cast iron), both equipped for simple reverse current wash, for sectional washing or for mechanical or air agitation. Will sustain any desired test or



Vertical Pressure Filter or Zeolite Softener



Horizontal Pressure Filter

working pressure. Water may be applied by gravity or pumped directly through them into piping systems, tanks, reservoirs or standpipes. Any number of pressure filters may be connected together in battery form. Filtering sand will last from five to seven years without changing.

SIZES AND CAPACITIES OF VERTICAL PRESSURE FILTERS

Diam., in.	Inlet and outlet pipes, in.	Waste pipe, in.	Capacity per hour, U. S. gal.	Approximate shipping weight, lb.			Effective filtering area, sq. ft.	*Test pressure per sq. in.
				Case	Parts	Filter's mat'l		
24	1 1/2	2	360-540	850	300	1200	3.14	Stock filters, 125 lb. *
30	1 1/2	2	600-900	1500	300	1650	4.90	
36	1 1/2	2	840-1260	1575	425	2800	7.06	
40	2	2 1/2	1120-1560	1625	650	3400	8.72	
42	2	2 1/2	1140-1740	1700	700	3848	9.62	
48	2 1/2	3	1500-2220	2025	850	5450	12.56	
50	2 1/2	3	1620-2460	2350	875	5700	13.63	
60	2 1/2	3	2340-3540	3300	950	7800	19.63	
72	3	4	3360-5040	4000	1300	10000	28.27	Stock filters, 100 lb.
78	3	4	3960-5940	5000	1300	12000	33.18	
84	4	5	4680-6900	5700	2000	13600	38.48	
96	4	5	6000-9000	9350	2000	17700	50.26	

*Filters to stand 150 or 200-lb. test are special.

Above capacities conservative—use minimum for muddy waters. Where maximum capacities are exceeded, resistance will increase, filter will require washing more frequently, and filtered water will not be of as good quality.

SIZES AND CAPACITIES OF HORIZONTAL PRESSURE FILTERS

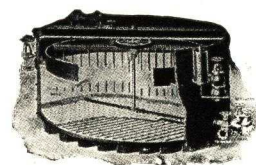
Diam., ft.	Length over all, ft.	Inlet and outlet pipes, in.	Waste pipe, in.	Capacity per hour, U. S. gal.	Approximate shipping weight, lb.			Test pressure per sq. in.
					Case	Parts	Filter's mat'l	
8	10	6	8	9600-14400	9000	3500	33000	Stock filters, 100 lb.
8	12	6	8	11400-17400	10800	4000	39600	
8	14	6	8	13500-20100	12600	4500	46200	
8	20	8	10	19200-28800	18000	6500	66000	
8	25	8	10	24000-36000	22500	7000	82500	
8	30	8	10	28800-43200	27000	7500	99000	

Minimum capacities are recommended for turbid waters.

Gravity Filters

Built round or rectangular, of wood, steel, concrete or masonry and equipped for washing with or without mechanical or air agitation, or for sectional or high velocity washing.

Similar in operation to pressure type.



Open Gravity Filter or Zeolite Softener

SIZES AND CAPACITIES OF OPEN GRAVITY FILTERS

Diam., ft.	H'ght, ft.	Inlet and outlet pipes, in.	Waste pipe, in.	Capacity per hour, U. S. gal.	Approximate shipping weight, lb.			Area, sq. ft.
					Tank	Parts	Filter bed	
6	7	3	6	3420	1350	1200	11300	28.27
8	7	4	6	6120	1750	2250	20000	50.26
10	7	4	8	9600	2250	3300	31200	78.54
12	7	5	10	13800	2800	5500	45200	113.10
14	7	6	10	18840	3450	6500	61200	153.94
15	7	6	10	21600	4000	8300	70400	176.71
17	7	8	12	27780	4600	11000	90400	226.98

Capacities given are minimum for turbid waters and will be exceeded from 50 to 100% in filtering waters carrying small quantities of sediment.

E. W. BACHARACH & COMPANY

Water Purification Plants

Rialto Building, KANSAS CITY, MO.

Products

WATER PURIFICATION PLANTS of any capacity and for any purpose.

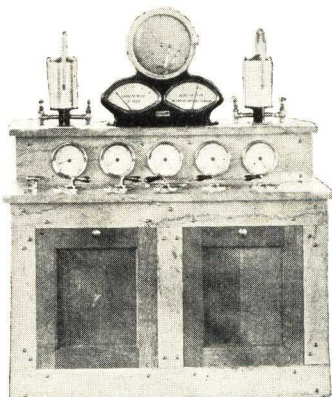
Filtration Plant Equipment; Activated Carbon Plants; Gravity and Pressure Filters; Iron Removal Plants; Recarbonating Apparatus; Swimming Pool Recirculating, Filtering, and Sterilizing Systems; Water Softeners; Plants for Elimination of Color, Odor and Taste from Water.

Co-operative Service

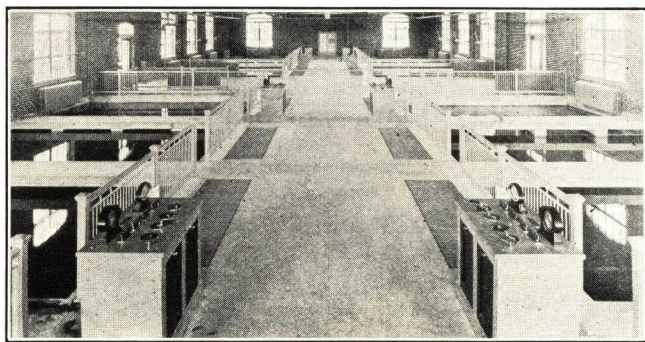
Our specialized experience is available, without obligations, to any consulting engineer or architect, to whom we will furnish, upon request, recommendations, estimates of cost, designs of equipment, descriptive data and information relating to any particular water purification project.

Water Purification Plant Equipment

Complete equipment for municipal or industrial filtration, softening, and other water purification plants. Aerators, automatic chemical control and proportioning apparatus, chemical feeders, water sampling apparatus, water level regulators, chemical testing equipment, rate of flow controllers and gauges, loss of head gauges, filter operating tables and hydraulic valve control devices, strainers and under-drain systems, filter sand and gravel.



Filter Operating Table

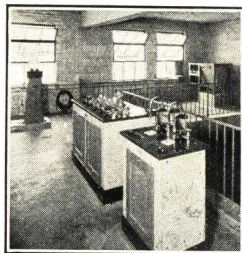


Gravity Filtration Plant—Operating Floor

Swimming Pool Filters

We have specialized for many years in furnishing and installing complete recirculating, filtering and sterilizing plants for Swimming Pools, and have provided such equipment for numerous outstanding, important and successful pools.

We supply such plants of Gravity, or Pressure type.



Swimming Pool Filtering and Sterilizing Plant

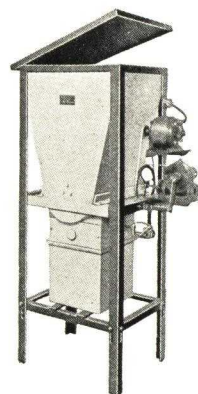
Dry Chemical Feeders

Dry Chemical Feed Machines of several designs for meeting any conditions of service, and for accurately feeding from a few ounces to thousands of pounds per day of any granulated or pulverized materials.

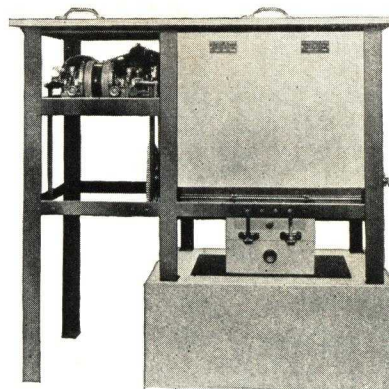
When only one chemical is to be fed, our type "S" Feeder, herewith shown, is recommended. When two, or more, different chemicals are to be fed it is usually advantageous to install one of our Multiple Machines of which the type "RD" Feeder, herewith illustrated, is an example. This apparatus will feed two different chemicals simultaneously at any desired rates. Feeders may be manually operated to feed at a constant rate, or may be automatically operated to feed in exact proportion with a variable demand.

Solution plants for feeding any chemical solutions at constant, or varying rates.

Lime slakers in combination with Dry Feed Machines, or separate.



Type "S" Dry Chemical Feeder

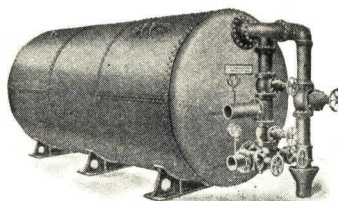


Type "RD" Chemical Feeder

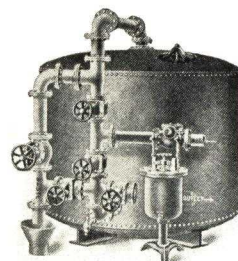
Water Filters

Horizontal and vertical pressure filters built to withstand any hydrostatic pressure and ranging in capacity from 10 to 525 gal. per min. each. By combining two or more filters any desired capacity may be obtained. Filters are furnished complete with strainer system, filtering material, immediate pipe, valves and fittings, and with or without gauges, control devices, coagulant feeder, etc.

Wood or steel tank gravity type filters in capacities from 40 to 628 gal. per min. each.



Style H Pressure Filter



Style F Pressure Filter

ELGIN SOFTENER CORPORATION

Water Conditioning and Softening Equipment

ELGIN, ILL.

Products

SLUDGE DECONCENTRATORS.
CONTINUOUS BLOW-DOWN SYSTEM with HEAT EXCHANGER.
ZEOLITE-DECONCENTRATOR COMBINATION.
CHEMICAL TREATMENT for BOILERS.
CHEMICAL CONTROL EQUIPMENT.
ZEOLITE SOFTENERS.
AUTOMATIC PROPORTIONERS.
PRESSURE SAND FILTERS.
CONCENTRATION METERS.
ELGIN ANTI-CORROSION TREATMENTS.

Water Conditioning Service

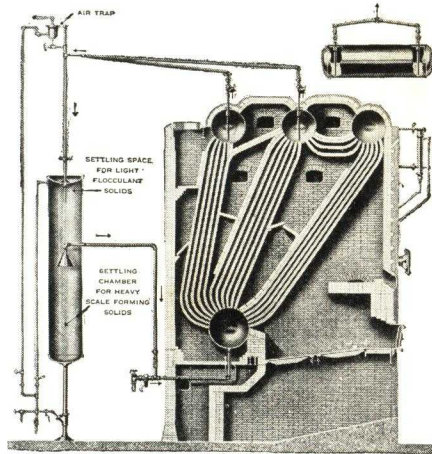
For twenty-five years the ELGIN SOFTENER CORPORATION, formerly the Reiter Company (established in 1908), has specialized in water conditioning. A large staff of competent engineers is maintained throughout the country to investigate industrial water and boiler water problems. A thoroughly equipped chemical laboratory devoted entirely to water chemistry, capable of handling problems up to 3000 lb. steam pressure, is maintained in Elgin. This service is available to all users.

Elgin Sludge Deconcentrators for Boilers

The equivalent of 25% to 50% of hourly evaporation in a boiler is automatically circulated through a sedimentation chamber. Suspended matter in boiler water settles to bottom and

clarified water returns to boiler. Any oil in boiler water passes to the sedimentation chamber, and is removed periodically through a drain valve.

Continuous circulation of boiler water to sedimentation chamber produces uniformly clean water so necessary for clean steam. Correct conditioning of feed water occurs, blow-down is materially reduced and embrittlement, corrosion and scale are absolutely prevented.

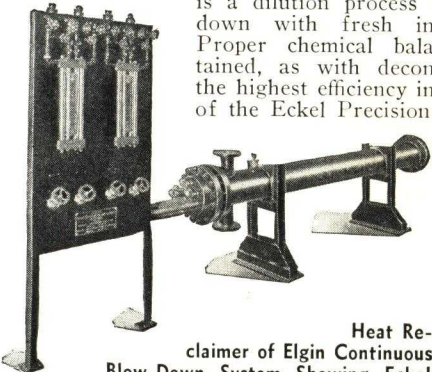


Elgin Sludge Deconcentrator Installed in Stirling Boiler

Showing piping and sediment or settling chamber

Elgin Continuous Blow-Down System

Indicated where the problem is primarily soluble salts. Elgin Continuous Blow-Down System and Heat Exchanger is a dilution process which replaces blow-down with fresh incoming feed water. Proper chemical balance must be maintained, as with deconcentration, to secure the highest efficiency in operation. By means of the Eckel Precision Control (patents applied for) the flow of blow-down from each of 1, 2, or more individual boilers can be accurately and individually measured and controlled from one centralized control panel, regardless of the evaporation rate and fluctuation of any or all boilers.



Heat Reclaimer of Elgin Continuous Blow-Down System Showing Eckel Precision Control Arranged for Four Boilers

The blow-down from each of a battery of boilers passes

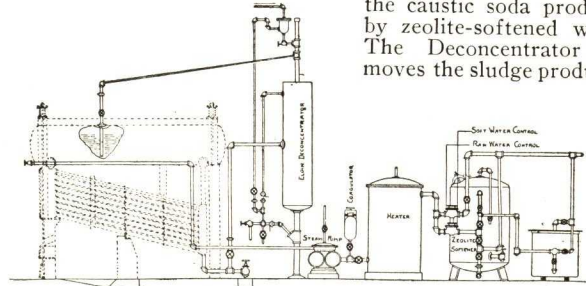
through certain designated tubes of a single or two-stage heat exchanger. The blow-down water leaving the heat exchanger is regulated in accordance with a manometer. Blow-down may be intermittent or continuous without waste of heat units.

Elgin Chemical Treatment for Boilers

Elgin manufactures and supplies chemical treatment compounded to meet the individual requirements of boiler waters. The Elgin laboratory forwards water containers for samples of boiler water for analysis. Testing outfits are also available which enable the plant operators to regularly check the boiler water. These tests are recorded on log sheets which the plant engineer sends to the laboratory for inspection and comment. The quantity of treatment is thus proportioned in accordance with chemical tests.

Elgin Zeolite-Deconcentrator Combination

Furnishes soft water for industrial purposes, yet safe soft water for boiler use. It eliminates danger of caustic embrittlement, excessive blow-down and wet steam, yet provides a low first-cost installation. The system by-passes a definite quantity of raw water to react with the caustic soda produced by zeolite-softened water. The Deconcentrator removes the sludge produced.

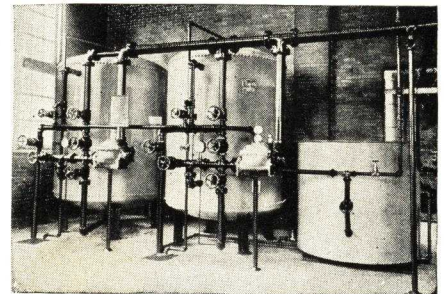


Elgin Zeolite-Deconcentrator Combination

The Elgin Combination produces ideal boiler water at minimum operating expense, and eliminates the danger from uncontrolled caustic in the boiler water. At the same time it provides a soft water without any additional cost for softening apparatus.

Elgin Zeolite Softener

Elgin Zeolite Softeners are built in both upflow and downflow types. The valve nest can be arranged to permit the softener unit to operate either upward flow or downward flow as the purchaser desires. Operating upon the upward-flow principle, maximum softening capacity per regeneration occurs with minimum waste of wash water and attention. The Elgin design overcomes bed blowing, channelling, packed and fouled beds, and cuts cost for salt, zeolite and dirt removal. Freedom from attention, great overload capacity and low operating cost, ability to use natural or synthetic zeolite and maximum return upon unit of ground space and dollar invested have caused Elgin Zeolite Softeners to introduce a new standard of performance for this type of softener. Built in all sizes—domestic, industrial; vertical, horizontal; single units or batteries.



Typical Elgin Double Unit Industrial Zeolite Softener Installation

Showing softener and brine tank at right

Rebuilding Softeners

Elgin specializes, also, in rebuilding existing softeners to conform to Elgin principles, with marked economy and increased capacity. State problem and ask for information.

INTERNATIONAL FILTER CO.

Water Softening and Filtration Plants

59 East Van Buren Street, CHICAGO, ILL.

OFFICES IN PRINCIPAL CITIES

Products

WATER PURIFICATION EQUIPMENT:

Acid Feeders and Proportioners.
Aerators, Nozzle or Tray Type.
Basin Level Controllers.
Boiler Feed Water Treating Plants.
Chemical Control Apparatus.
Chemical Feeders, Dry or Solution Types.
Coagulating Basin Equipment.
Color Removal Plants.
Controllers and Automatic Control Equipment.
Crystalite Water Softeners.
Dechlorinators, Water.
Directional Flow Controllers.
Disc Filters.
Filtration Plant Equipment and Accessories.
Filter Underdrain Systems.
Flow Indicators and Recorders.
Gravity Filters.
Hot-Flow Water Softeners.
Hydraulic Valve-control Equipment.
Hydrodarco.
Iron-removal Plants.
Lime-Soda Water Softeners.
Loss-of-head Gauges.
Manometers, Flow-indicating.
Odor-removal Plants, Water.
Oil-removal Filters, Water.
Operating and Control Tables.
Pressure Filters.
Recarbonating Plants.
Rate-of-flow Controllers and Gauges.
Strainers and Distributing Nozzles.
Steam Purifiers.
Swimming Pool Design and Equipment.
Taste-removal Plants, Water.
Venturi Tubes and Infilco Meters.
Venturi Rate-of-flow Indicators.
Wagner Bottom Underdrain Systems.
Water Filters for every need.
Water Softeners of every type and size.
Water Still.
Zeolite Mineral and Zeolite Water Softeners.



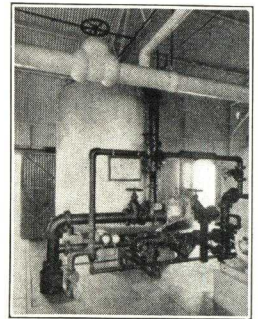
that the particles will scratch glass) and resistant to erosion or abrasion. Crystalite has been in successful use well over eight years, with great efficiency and economy.

Crystalite Water Softeners

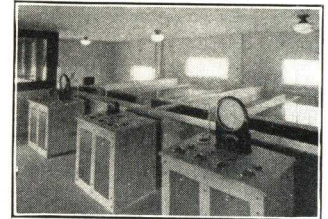
The high rate performance of International Crystalite Softeners is made possible by the design which brings the full power of Crystalite into efficient use and keeps it readily under control. Simple operation, orderly and compact arrangement; symmetrical and accessible valve control; automatic rate-of-flow indicator, etc., are but a few of the many details completely provided.

The International Crystalite Softener will meet the most exacting requirements for textile process water, cooling water, boiler feed, etc., where water of "zero" hardness is required.

Pressure Type—As the name implies, this type is furnished in closed steel containers, of one or more units, complete with Crystalite and internal piping, external operating valves and piping, flow indicator, meter, brine tank, brine control, etc.

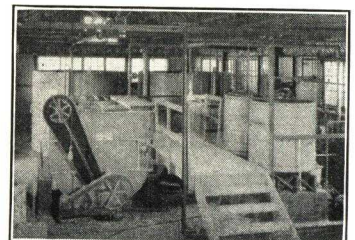


Open Type—When following gravity filters, or where an open reservoir is used for soft-water storage, this type (with either concrete or wood tank basins) may be used to obtain all the advantages of visible operation, accessibility, automatic control, etc.



Lime-Soda Water Softeners

Complete water softening plants with one or more wood, steel or concrete sedimentation tanks; top or ground operation; built to meet any operating conditions. Capacities, 125 gal. per hour up to millions of gallons per day. Arranged for any desired degree of automatic operation. Uniformity of treatment guaranteed under all conditions.



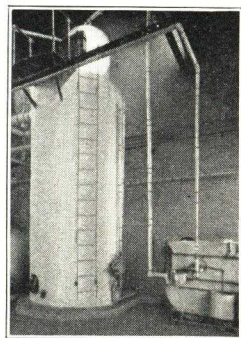
Crystalite

Crystalite is a pure white (colorless) zeolite; 100% active material; high in capacity, super-rapid acting; and economical in salt consumption. Crystalite is insoluble, hard, flintlike (so hard



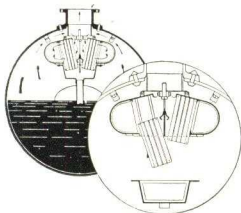
Hot-Flow Water Softeners

The Hot-Flow has set new standards in the combined heating and treating of boiler feed water. Imperfect sedimentation is impossible with Hot-Flow tank construction. Filter is not overloaded. Hot water filter wash and wash return. International Chemical Mixing, Feeding and Proportioning Equipment provides absolute uniformity of treatment. Residual hardness reduced to less than $1\frac{1}{2}$ grains per gallon. Maximum reduction of alkalinity. De-aerating heater and elimination of dissolved oxygen, when required.



Steam Purifiers

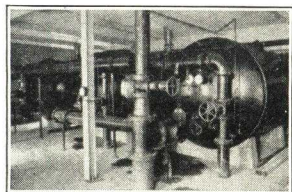
External line type or internal type for all sizes and types of boilers. Furnished complete with all special fittings and pressure-discharge system. Removes all moisture and dirt from steam; increases degree of superheat and eliminates clogging of steam lines, valves, governors, safety devices, etc.



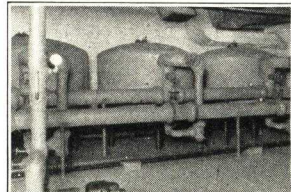
In connection with steam piston type blowdown valve, operated by purified discharge, provides for automatic boiler blowdown.

Water Filters

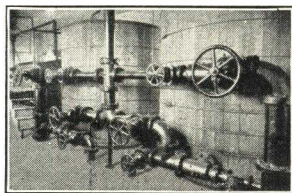
Vertical or horizontal pressure types. Wood tank or concrete gravity types. Any capacity from 100 gal. per hour to millions of gallons per day. Filters are furnished complete with wash and collecting manifold system, full charge of filtering material, all



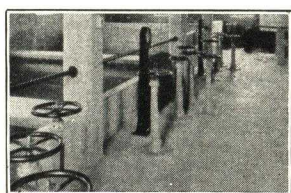
Pressure Filters



immediate pipes, valves and fittings necessary for operation and with or without control devices, gauges, coagulant feeding apparatus, accessory equipment, etc., as desired.



Wood Tank



Concrete

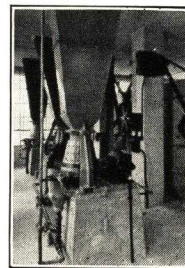
Gravity Filters

Chemical Feeders

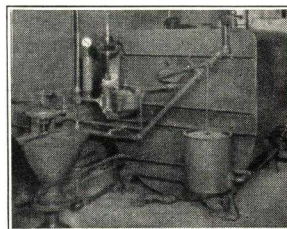
International Dry Chemical Feeders handle from a fraction of a pound to hundreds of pounds per hour of lime, soda, alum, carbon, etc.

Recommended for process industries and water treating plants to reduce operating labor costs.

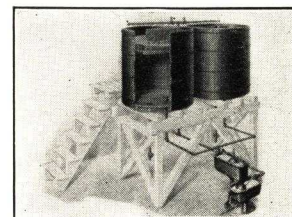
Wet feeders with International system of vertical agitation provides uniformity of chemical mixture and foolproof chemical feed. Solution feeders of all types and sizes. All chemical feeders can be arranged for automatic proportional feed for variable rate operation as well as manual control.



Dry Chemical Feeder



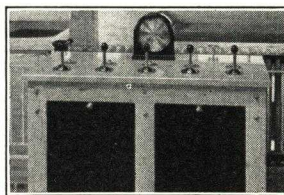
Milk of Lime Feeder and Proportioner



Solution Tanks and Orifice Box

Purification Plant Equipment

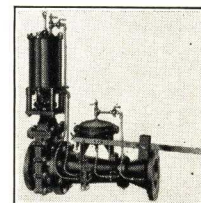
Complete equipment for industrial or municipal water purification plants. Automatic chemical control and proportioning apparatus. Chemical pumps. Rate-of-flow controllers, venturi type. Flow indicating manometers. Venturi tubes. Rate-of-flow gauges—indicating or recording or combination. Loss-of-head gauges, float tube or mercury type. Filter operating or control tables. Water-level regulators. Wagner Block Filter Underdrain Systems. Tobin Bronze Strainers. Distributing and collecting manifold systems. Pipe gallery fittings, valve floor stands, etc.



Filter Operating Table



Flow Gauge



Controller

Miscellaneous Equipment

Equipment built to meet every problem of water purification, such as color, iron, or oil removal, sterilization, coagulation, etc. Submit your problem.

Co-operative Service

INTERNATIONAL FILTER CO. specializes on water purification for industrial, institutional and municipal purposes. A complete laboratory and staff of engineers is maintained to make reports and recommendations. This service is intended to co-operate and not conflict with the work of any representative or engineer retained by the prospective purchaser.

LAKESIDE ENGINEERING CORPORATION

Water Treating and Sewage Plant Equipment

176 West Adams Street
CHICAGO, ILL.

REPRESENTATIVES IN PRINCIPAL CITIES

Water Rectification

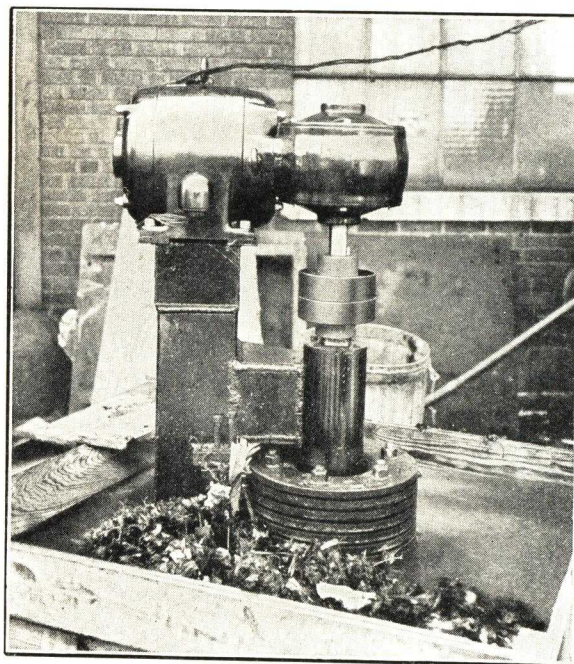
The Lakeside line includes complete equipment for all water rectification purposes:

- Aerators
- Agitators—mechanical and pneumatic
- Acid Feeders and Proportioners
- Activated Carbon
- Chemical Feeders—dry and wet
- Chlorinating Apparatus
- Color Removing Equipment
- Controllers
- Dechlorinators—water
- Filters—gravity and pressure
- Floor Stands
- Flow Indicators
- Gauges
- Iron Removal Plants
- Laboratory Devices
- Manifold Systems
- Main Line Meters
- Odor Control Equipment
- Operating Tables
- Oil Removal Filters
- Recarbonators
- Softeners, Zeolite
- Softeners, Hot and Cold Lime Soda
- Strainer Nozzles
- Swimming Pool Equipment
- Wash Troughs
- Wood Tub Filters
- Zeolites—natural and synthetic

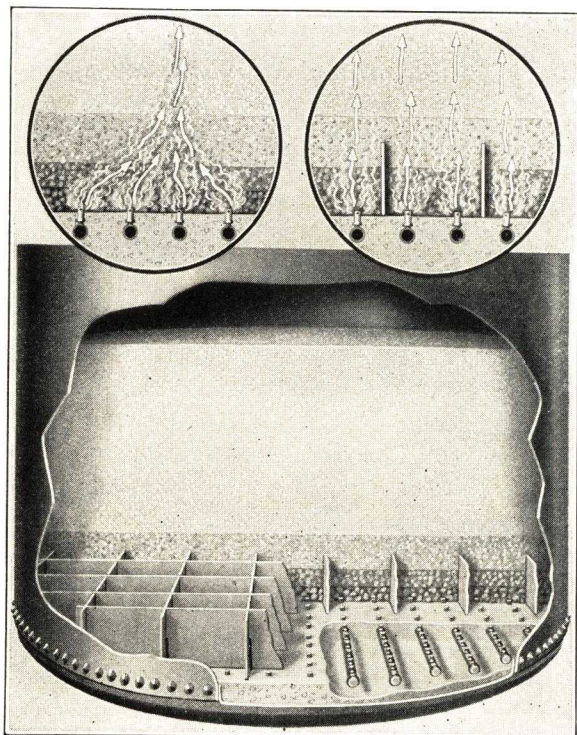
Sewage Disposal Equipment

The performance of all Lakeside Sewage Disposal equipment is guaranteed. The line includes:

- Mechanical Aerators
- Comminutors (cutting screens)
- Screens—rotating, self-cleaning
- Settling Tanks
- Sludge Pumps



Lakeside Comminutor



Lakeside Patented Gravel Bed Construction

Guaranteed to prevent gravel bed disruption in both water softeners and filters



Municipal Gravity Filter

ROBERTS FILTER MANUFACTURING CO.

612 Columbia Avenue
DARBY, PA.

Products and Co-operative Service

PRESSURE FILTERS, Vertical and Horizontal Types.

WOOD TANK GRAVITY FILTERS.

Equipment for REINFORCED CONCRETE GRAVITY FILTERS.

FILTRATION PLANT SPECIALTIES.

Equipment for applying chemicals to water.

We maintain an extensive Engineering organization which is at your command on all problems involving the rectification of water. Our service is intended to co-operate, and not conflict with the functions of the Consulting Engineer in charge of improvements. Full information on the application of our products will be mailed on request. We invite the opportunity to co-operate with all Engineers and Architects interested in the correction of water, either for Municipal or Industrial requirements.

Experience

Thirty-five years devoted exclusively to the manufacture and installation of water rectification equipment. Roberts Filters are now clarifying more than two billion gallons of water daily. Our installations are serving hundreds of municipalities and institutions with drinking water and many industrial establishments are dependent on Roberts Filters for process water. In the industrial field our customers include Paper Mills, Textile Finishing Plants, Rayon Establishments, Chemical Industries and similar large scale users of water. Our smaller services comprise Laundries, Raw Water Ice Plants, Bottling Establishments, etc.

Installations of Roberts Filters will be found in every state in the United States and in many foreign countries.

Roberts Standard Vertical Pressure Filters

These filters come in four styles; "E," "G," "H," and "L." The Style "E" filter is constructed of cast iron and is capable of withstanding working pressures up to 60 lb. per sq. in.

The Style "H" and Style "L" filters are constructed for either 60 or 100 lb. working pressure, with the exception that the 30 and 36-in. sizes are furnished for 100 lb. working pressure only.

All filters are furnished with full charge of filtering material, immediate filter pipes, valves and fittings, and pressure coagulant feeding device.

Roberts Horizontal Pressure Filters

These filters are constructed of steel and designed either for 60 or 100 lb. per sq. in. working pressure.

They are furnished with full charge of filtering material, immediate outside pipes, valves and fittings, and pressure coagulant feeding device.

The shells are tested to hydrostatic test pressure 50% in excess of that under which they are intended to operate.

All external piping is standard wrought pipe with cast iron flanged and screwed fittings.

All valves are of the gate pattern, double disk, wedge type, with iron body and bronze mountings.

Pressure gauges are furnished on raw water influent and filtered water effluent pipes.

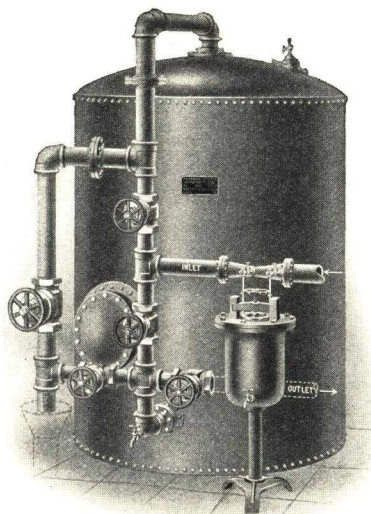
Supporting cradles are of heavy cast iron, or concrete, as specified.

Roberts Gravity Filters

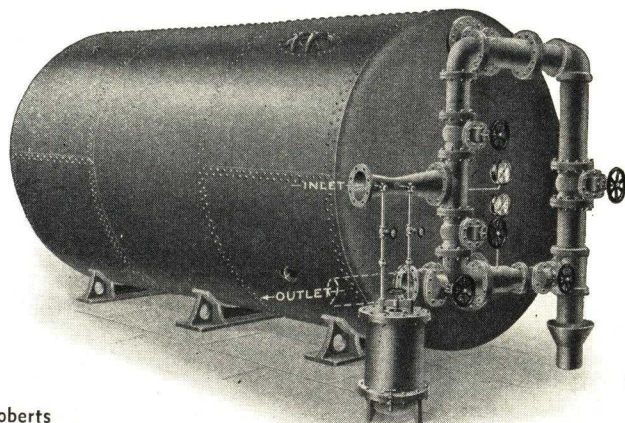
The illustration represents the standard wood tank high rate wash gravity filter unit such as is commonly employed in industrial installations and the smaller and more temporary municipal plants. They are usually operated, however, in conjunction with a wood tank settling basin. The type of filter shown is furnished complete with manifold and strainer system, filtering material, circumferential and cross wash troughs, immediate pipes, valves and fittings, rate controller and indicating loss of head gauge. The valves are operated by means of hand wheels with floor stands and extension stems.

Wood tank gravity filters may also be equipped with mechanical agitator. When this type is desired, full particulars will be sent on request.

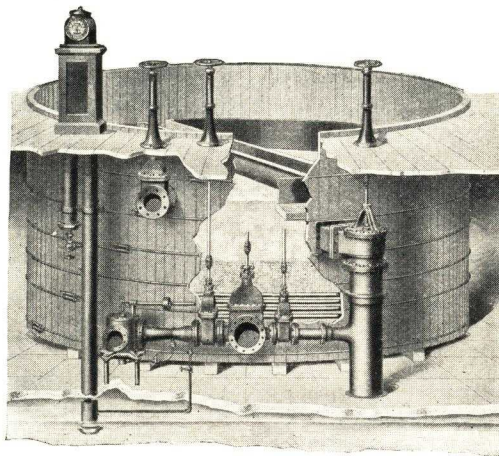
Standard designs for concrete plants will be submitted on request.



Roberts Vertical Pressure Filter
Style "H"



Roberts
Horizontal
Pressure Filter



Roberts Wood Tank Gravity Filter

THE PERMUTIT COMPANY

World's Largest Exclusive Makers of Water Treating Equipment
All Types—All Sizes—For All Purposes

TELEPHONE
BRyant 9-9050

330 West 42nd Street, NEW YORK, N. Y.

CABLE ADDRESS
"Permutit New York"

SALES OFFICES

BOSTON, MASS., 705 Statler Building
BUFFALO, N. Y., 716 Brisbane Building
CHARLOTTE, N. C., 1316 Greenwood Cliff
CHATTANOOGA, TENN., 411 Provident Building
CHICAGO, ILL., 332 So. Michigan Avenue
CLEVELAND, OHIO, 1408 B. F. Keith Building
COLUMBUS, OHIO, 262 Midland Avenue
DETROIT, MICH., 502 Free Press Building

FORT WORTH, TEX., 347 Majestic Building
INDIANAPOLIS, IND., 3861 College Avenue
KANSAS CITY, MO., 215 Pershing Road
LOS ANGELES, CALIF., 909 Wright Callender Building
MINNEAPOLIS, MINN., 307 Essex Building
PHILADELPHIA, PA., 34 So. 17th Street
PITTSBURGH, PA., 1407 Gulf Building
ST. LOUIS, MO., 4064 Oliver Street

PERMUTIT COMPANY OF CANADA, LTD.

AGENTS

CALGARY, ALB., Stanley Brock, Ltd., 325 10th Avenue, West
TORONTO, ONT., Busfield McLeod, Ltd., 73 Adelaide Street, West

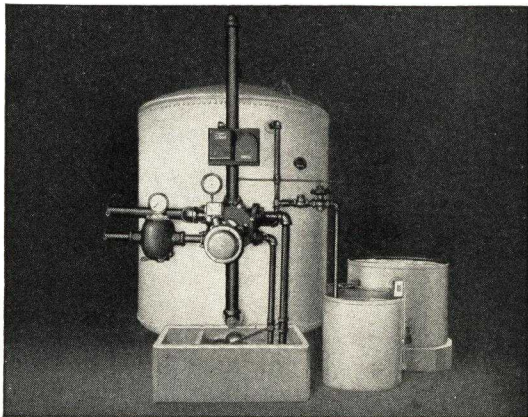
MONTREAL, QUE., Busfield McLeod, Ltd., 1440 St. Catherine Street, West
WINNIPEG, MAN., Stanley Brock, Ltd., 145 Market Street, East

Products

A complete line of WATER TREATING EQUIPMENT, including:

Manually operated and fully automatic Downflow and Upflow Zeolite Water Softeners; Porous and Non-porous Zeolites; Hot Process and Cold Process Intermittent and Continuous Lime Soda Water Softeners; Pressure and Gravity Filters; Taste, Color and Odor Removing Equipment; Activated Carbon Filters; Coagulant and Corrective Chemical Feeds; Iron and Manganese Removal Equipment; Continuous Blowoff Equipment; Anti-corrosion Equipment; Carbon Dioxide Recorders; etc.

New Fully Automatic Zeolite Water Softener



New Fully Automatic Zeolite Water Softener

The new Permutit Fully Automatic Zeolite Water Softener is revolutionizing zeolite water softener practice. For this softener eliminates the errors due to the human element and conducts all of the operations of softening and regeneration with machine-like regularity and precision.

The advantages are: a completely softened water, a more efficient performance, a saving in salt and a saving in wash and rinse water. For the automatic controls are always on the job and never forget.

The operation of the softener depends on a motor-driven Permutit Single Valve, the periodic partial rotation of which is governed by a combination of a meter-operated switch and electric controls. Briefly, at the end of each softening run, the meter actuates the electric controls which carry through the

steps of: cutting the softener out of action; backwashing it for a regulated period so as to secure thorough cleansing; admitting a carefully regulated amount of salt brine of definite strength so as to assure thorough regeneration without wastage of salt; washing out the hardness salts to waste with the minimum amount of rinse water; and returning the softener to service, thus placing it again under control of the meter, which governs the volume of water to be softened during the softening run and initiates the start of the next regenerating cycle.

Write for complete information on the Permutit Fully Automatic Zeolite Water Softener.

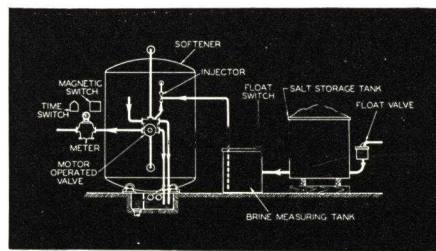


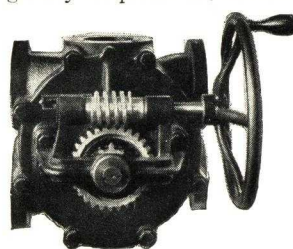
Diagram Automatic Zeolite Water Softener

Fully Automatic Controls

Not only may the new models be had in the fully automatic type but it is also a relatively simple matter to apply the automatic control to existing zeolite water softeners, thus converting manual to fully automatic operation. With these controls you can convert your manually operated zeolite water softeners to fully automatic operation, thus increasing their efficiency, and assuring a completely softened water at less cost per thousand gallons of water softened. Write for complete information on modernizing your present zeolite water softening equipment.

Single Valve for Manual Operation

The Permutit single valve used in the fully automatic models is also available in the manually operated models. Its use greatly simplifies the control of a water softener and eliminates



Permutit Single Valve

many of the errors due to manual operation. For this one valve replaces a multiplicity of valves and to carry out the process of regeneration, is simply rotated through a series of plainly marked positions. Due to its unique design, sticking is eliminated. Permutit single valves may also be applied to present types of manually operated zeolite water softeners. Write for details.

Permutit Zeolites

For efficient and economical performance, it is essential that the zeolite employed in the water softener be of the correct type and quality. Permutit zeolites are manufactured and processed under rigid technical control in the world's largest zeolite plant at Birmingham, N. J. Careful supervision of all processes and complete up-to-date equipment are responsible for the long, satisfactory service given by Zeo-Dur and Decalso in Permutit water treating installations all over the world.

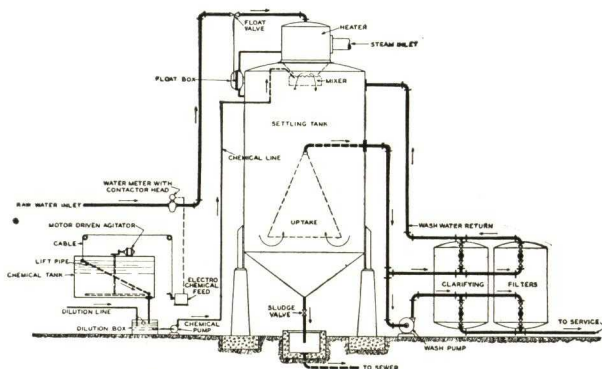
Zeo-Dur—The original glauconite (greensand) zeolite. Specially processed for maximum ruggedness and uniformity.

Decalso—The standard of synthetic zeolite quality. High exchange capacity—strong grain structure.

Special Zeolites—For the removal of iron, manganese, etc. Other zeolites made for special conditions. Prices on application.

Cold Lime Soda Water Softeners—Intermittent and Continuous Types

In these, the precipitations are carried out at ordinary temperatures. For waters of highly variable composition, the Intermittent type, using two or more settling tanks, is preferable, as it allows the batch system of treatment to be employed. With waters that are not subject to sudden and extreme variations in composition, the Continuous type, using a single settling tank, is preferable. With the usual excesses of chemicals employed, the Cold Lime Soda Process will reduce the hardness of the water down to about 3 to 5 grains per gallon.



Permutit Hot Lime Soda Softener

Hot Lime Soda Water Softeners

In these, the precipitations are carried out at temperatures at or near the boiling point. At such temperatures, the reactions proceed much faster, allowing the use of smaller and more compact equipment. The degree of softening obtained is also much more complete, with smaller excesses of chemicals, thus making this process much more suitable for treating the boiler feed water for stationary boiler plants than the cold process. With the usual excesses of chemicals employed, the Hot Lime Soda Process will reduce the hardness of the water down to about 1½ to 2 grains per gallon.

Iron and Manganese Removing Equipment

Iron and manganese, whether in solution or suspension, whether existing as organic or inorganic salts, can be reduced to negligible quantities. The equipment used to accomplish this purpose is specially designed to fit each specific case. In addition to the more or less standard methods, THE PERMUTIT COMPANY has developed special manganese zeolite equipment capable of transforming manganese salts into insoluble oxides, and removing them as the water is passed through the filter.

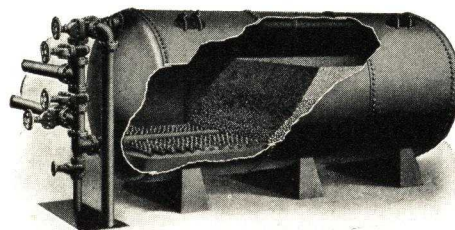
Chemical Feeds

Where chemicals are added in the treatment of water the Chemical Feed is of paramount importance. Permutit design represents the latest developments, and embodies many exclusive features. Underfeeding and overfeeding are prevented; accuracy is maintained at wide ranges of flow; adjustments are quickly and easily made. Various types of feed are available, according to the requirements of each installation.

Water Filters

Water rendered clear, clean and suitable for any industrial or domestic purpose. Permutit Filters and filtration plants for filtering boiler feed water and industrial supplies may be had in all sizes for any capacity. They embody the best acknowledged features of design and will give satisfactory service even under severe operating conditions.

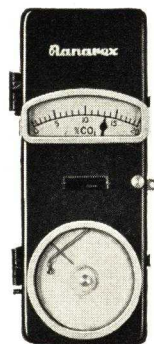
Auxiliary chemical feeding equipment, settling tanks, etc., required for coagulating impurities before filtration are also supplied for installations ranging from households to large municipalities.



Typical Horizontal Steel Pressure Filter

Continuous Boiler Blowoff Equipment

By blowing off continuously at any desired rate, this equipment maintains a uniform concentration of salts in the boiler salines or evaporator salines. Equipment includes heat exchangers for the recovery of heat from the blowoff water, special control valves, and special patented Permutit Boiler Blowoff Hydrometers. There are a number of different arrangements to suit special conditions.



Ranarex CO₂ Indicator and Recorder

Ranarex CO₂ Indicators and Recorders

Ranarex CO₂ Indicators and Recorders give the firemen a constant record of combustion conditions under their boilers.

Being completely mechanical in operation, they are extremely rugged—no delicate parts, no hot wires, no chemicals.

This equipment is attached to the front of the boiler or on the panelboard where its large dial can be easily read 30 ft. away.

Its time lag is less than one minute under average conditions.

Ranarex is inexpensive to operate and quickly saves its initial cost. More than 5000 in use.

Activated Carbon Filters

Water may at times have an unpleasant taste or odor, which makes it unpalatable for drinking, and distinctly undesirable for use in the preparation of beverages and food products.

Activated Carbon Filters are available to remedy this condition. They are inexpensive, easy to operate and are made in a wide variety of sizes.

Partial List of Permutit Bulletins

- (1) "No Scale, No Sludge, No Mud"—Zeolite Softening. 36 pages illustrated, tabulated data, conversion tables, factors, etc.
- (2) "Hot Lime Soda Water Softening." 24 pages illustrated, conversion tables, method of calculating chemical charges, etc.
- (3) "Water Filters & Filtration Equipment." 28 pages illustrated, filter principles, design, types of chemical feeds, etc.
- (4) "How to Save Fuel and Improve Steam Quality with Permutit Continuous Blowoff Equipment." 20 pages illustrated, diagrams, principles of operation, applications, etc.
- (5) "Ranarex—The Mechanical CO₂ Indicator & Recorder." Illustrated leaflet describing principles and application.

The above list represents but a few of our bulletins on special subjects, any of which may be obtained free, on request. Kindly order by name.

The Oldest Manufacturers of Water Softening and Filtration Systems in America

EXECUTIVE OFFICES, LABORATORY AND WORKS
OAKMONT, PA. (Pittsburgh District)

CHICAGO

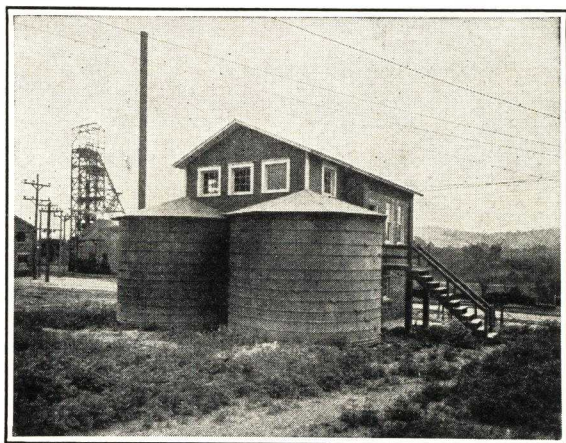
PITTSBURGH

NEW YORK

Scaife Gravity Filter Systems

A complete gravity filtration system, the type usually employed in small towns for domestic water supply, includes an automatic reagent feeding device, sedimentation tank, completely equipped filter, and necessary sterilizing apparatus. The reagents are introduced automatically and proportionately by the inflowing water without manipulation of the valves. The starting and stopping of the flow of water also starts and stops the treatment.

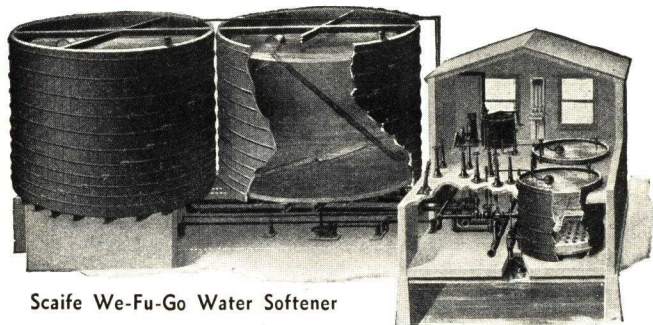
Scaife systems are practically foolproof and do not require expert or constant supervision. With this type of filtration system any usable water supply can be made clean, clear, sterile and potable for domestic consumption. Approved by all State Departments of Health.



Scaife Gravity Filter System

Scaife We-Fu-Go Water Softener

An intermittent type of lime-soda water softener particularly adapted to the softening and filtration of turbid waters of variable hardness from rivers and creeks. Tanks of known volume of water are treated with accurately weighed amounts of reagents, thoroughly stirred by mechanical agitation, allowed to settle and the treated water passed through filters. One tank is treated while the other is being used, thereby insuring a continuous flow of properly treated and filtered water for domestic water supply and boiler feed.



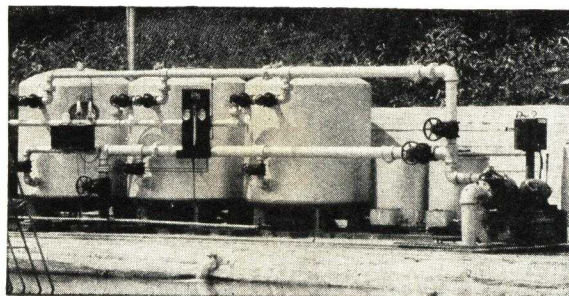
Scaife We-Fu-Go Water Softener

Scaife Pressure Filters

For the removal of suspended matter, turbidity, color and odor from water under pressure. These filters, where necessary, are equipped with chemical feeding devices for the proportional introduction of reagents to prepare the waters properly for filtration to deliver clean, clear water free from suspended matter. Pressure filter systems are built in single or multiple units of the vertical type or horizontal type for any desired capacity, and are used for the clarification of turbid waters before zeolite softening. Pressure filters are also in general use for the clarification of water for swimming pool recirculation systems. (See illustration at top of next column.)

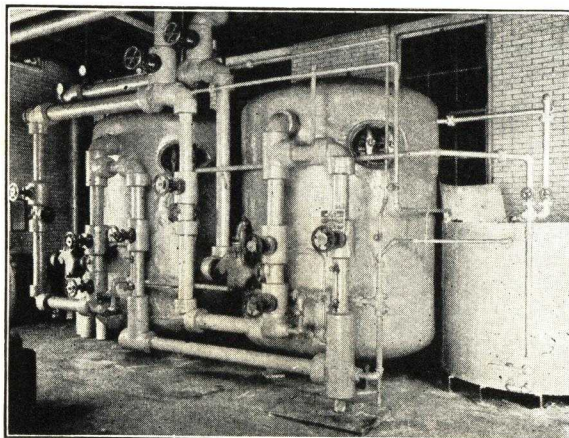
Scaife Zeolite Water Softener

A self-contained unit for the removal of calcium, magnesium and iron from water. Hard water is introduced at the inlet and soft water of zero hardness is discharged at the outlet. No adjustment of treatment required



Scaife Vertical Pressure Filters

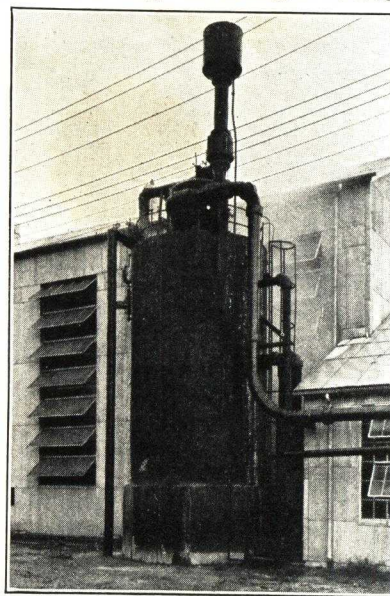
regardless of the variation of hardness of the raw water. All water passing through the softener is accurately metered. Common salt is the only reagent required. Completely regenerated in 20 to 30 minutes. Built in single and multiple units of the vertical or horizontal type for any desired capacity.



Scaife Zeolite Water Softener

Scaife Hot Process Water Softener

A complete unit of the continuous flow type for heating, de-aerating, softening and filtering raw water from any usable source. Condensate returns can also be reheated and de-aerated for use with the treated water. Scaife hot process systems are used principally for supplying feed water for high pressure boilers. By the method used, the total solids in the water are reduced to a greater degree than by any other method except distillation. Any desired sulphate-carbonate ratio or pH value can be maintained. The compactness of this type of system lends itself admirably to the installation of large capacities in small space.



Scaife Hot Process Water Softener

Guarantees and Service

All Scaife equipment carries a complete guarantee covering material, results and patent protection.

The results of the years of experience of our Engineers and Chemists are at your disposal. Tell us about your water problem and we will be glad to make recommendations to correct it.

ZEOLITE CHEMICAL COMPANY

PIONEER PRODUCERS OF
Greensand Zeolite

87 West Street
NEW YORK, N. Y.

TELEPHONE
REctor 2-8733

CABLE ADDRESS
"Zeochem, New York"

Products

ZECO GREENSAND ZEOLITE, a natural base-exchange mineral, used for water softening, filtration, and iron removal.

ZECO MANGANESE ZEOLITE for iron and manganese removal (without water softening).

GREENSAND MINERALS for special purposes.



Aeration for iron or taste removal.
Boiler feed water treatment.
Impounding reservoirs and dams.
Water storage.
Iron removal plants.
Prevention of water corrosion.

Chemical precipitation.
Purification of industrial waste.
And any other water supply problem.

Equipment

This Company designs, builds, and furnishes equipment for water supply and water purification works of all kinds, from large municipal and industrial plants to small domestic equipment. In line with present-day trends toward greater economies, we have developed equipment which will produce purified and softened water at unusually low operating costs.

Engineering and Service

Our engineering and chemical staff is at your disposal without obligation. It is fully equipped with technical data, supplemented by practical experience, on every phase of water treatment and hydraulics.

We have co-operated in the solution of many water problems. Quotations will be submitted upon determination of the conditions and needs of particular cases.

Call upon us for information, designs, equipment, and materials, including:

Zeolite for water softening.
Water softening equipment.
Zeolite for iron and manganese removal.
Coagulation and filtration.
Pressure filters.
Rapid mechanical gravity filters.
Slow sand filters.

Advantages of Zeco Greensand Zeolite

ZECO GREENSAND ZEOLITE is prepared from the natural greensand in our own plant with the most modern methods and equipment. It is cleaned, graded, and chemically treated in boiling solutions—an exclusive Zeco process—to provide full penetration of the sand grains. This treatment insures high efficiency of operation and long life. Zeco Greensand will soften hot water up to 200° Fahrenheit. It has a high effective size and a low uniformity coefficient which insures minimum losses of pressure and makes it especially suitable for combined water softening and filtration.

Zeco Greensand will also remove ferric, ferrous, and colloidal iron, in combination with water softening and filtration.

Printed Matter

The following printed matter is available from this Company on request:

"Softening Water with Greensand Zeolite."
"Advantages of Municipal versus Individual Water Softening."
"Softening Municipal Water Supplies by the Use of Zeolite."
"Municipal Water Softening Plant at Marshall, Missouri."
"Zeolite Plants Effect Economies in Railroad Uses."

"It Costs More to Use Hard Water Than It Does to Soften It"

Hard water forms scale in boilers, pipes, heaters, condensers, and other equipment, which adds greatly to the cost of fuel and equipment maintenance. In boilers, one-fifteenth of an inch of scale wastes ten per cent of the fuel. In addition there is the possibility of burned out tubes or shells and the cost of periodically removing the scale.

In the operation and maintenance of locomotives, savings from \$1000 to \$8000 per unit annually have been obtained by the use of soft water. One road estimates that its zeolite water softening plants are saving double their cost every year.

Soft water is needed in laundries, power plants, ice plants, textile mills, cleaning and dyeing establishments, tanneries, canneries, sugar factories, bottling works, hotels, club houses, hospitals, and countless other industries, institutions, and public utilities.

How Water Is Softened

There are three common methods of softening water—the zeolite (base-exchange) process, the lime-soda (precipitation) process, and a combination of the zeolite and lime methods. Because of its simplicity, the zeolite process is best adapted to nearly all industrial applications. In this process the water

is simply run through a bed of Greensand Zeolite, in either open gravity or closed pressure tanks. The flow can be either upward or downward. When the zeolite becomes exhausted it is regenerated with common salt.

As Zeco Greensand Zeolite lasts for many years without replenishment, practically the only operating cost is the cost of the salt.

Advantages of the Zeolite Process

Simplicity. Nothing to get out of order.
Dependable and economical operation.
Requires no engineering or chemical knowledge or experience.
No expert supervision. Anyone can operate a zeolite softener.
Takes up little space. No large sedimentation tanks.
No sludge removal. Aside from periodical regeneration of the zeolite mineral, the zeolite process requires no care or attention.
No mess, no dust, no special handling problems.
Removes all hardness, temporary and permanent, in one simple operation.
Delivers zero-soft water throughout the softening cycle.
Equally efficient in warm and cold weather.
Low first cost.

WALLACE & TIERNAN CO., INC.

Chlorine and Ammonia Control Apparatus for Water and Sewage Purification,
Swimming Pool Sterilization and Industrial Processes
NEWARK, N. J.

BOSTON, MASS.
BRIDGEPORT, CONN.
BUFFALO, N. Y.
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DENVER, COLO.
DETROIT, MICH.
HOUSTON, TEX.

INDIANAPOLIS, IND.
JACKSONVILLE, FLA.
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KNOXVILLE, TENN.
LEXINGTON, KY.
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PHILADELPHIA, PA.
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SEATTLE, WASH.
ST. LOUIS, MO.
SYRACUSE, N. Y.
WASHINGTON, D. C.

CANADA: Wallace & Tiernan Ltd., MONTREAL, QUE., TORONTO, ONT., and WINNIPEG, MAN.
ENGLAND: Wallace & Tiernan Ltd., LONDON

REPRESENTATIVES IN MOST FOREIGN COUNTRIES

Products

CHLORINE CONTROL APPARATUS (trade name "Chlorinators") for all uses in types and capacities to meet all conditions.

AMMONIA CONTROL APPARATUS ("Ammoniators") for the application of anhydrous ammonia. Direct feed types with all capacity ranges.

DRY CHEMICAL FEEDERS for application of chemicals in a dry state, either coarse granular or finely powdered. Two types for high and low feed ranges.

CYLINDER VALVES for use with compressed gases.



TRADE-MARK

A Nationwide Service

Continued satisfactory operation of W&T equipment is the direct responsibility of a nationwide service organization.

A field staff, operating from 42 District Offices, is available to assist in selecting the proper equipment for each job. Their recommendations involve no obligation. Call on them.

Current Literature

Current literature on chlorination, ammoniation and dry chemical application is available on request.

W&T PROCESSES

Chlorination

Universally used for sterilization and control of organic growths in water supply; for disinfection, odor control, B.O.D. reduction and other auxiliary uses in sewage treatment; for sanitation and algae control in swimming pools; for slime elimination in paper mills or power plant condensers; for bottle sterilization in dairies, bottling plants, etc. Offering as it does a cheap, efficient and thoroughly tried method of treatment it has played a large part in lowering the nation's typhoid death toll and is the means of effecting large economies in industry.

Ammoniation

Application of ammonia in conjunction with chlorine has added a new measure of safety and improved plant operation to water works practice. Chloramines while somewhat slower than chlorine in bactericidal action, offer many distinct advantages.

Chlorinous, chlorophenol and certain organic tastes and odors are prevented; after-growths are destroyed; algae control made more efficient.

Positive sterilizing action may be carried throughout the system to consumer's tap, eliminating dangers of subsequent pollution yet creating no taste complaints from users.

Chloramine treatment is of particular value in swimming pools since it enables the operator to carry a higher residual to take care of variations in pumpage and chlorine demand without taste or odor troubles.

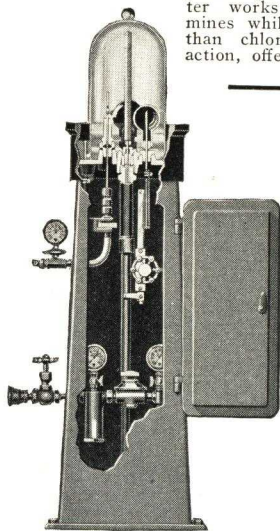
Application of Dry Chemicals

Of great value in both sanitary and industrial fields. Difficulties from leaking tanks, corroded constant level boxes, clogged orifices, broken valves and all untidiness and disagreeable features incident to solution feed systems are eliminated. Labor is reduced and a saving in materials effected.

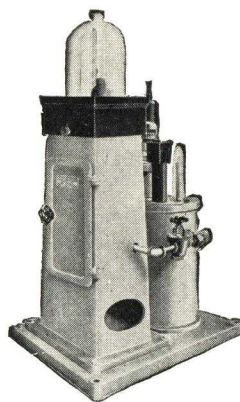
W&T EQUIPMENT



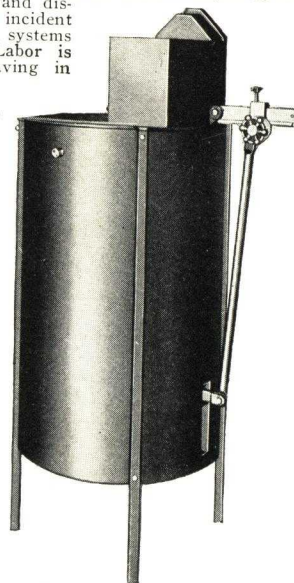
Type MSP
Chlorinator



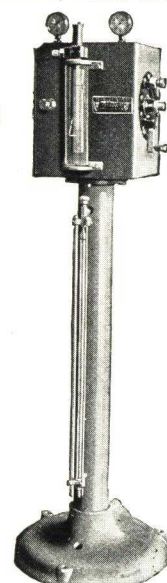
Vacuum Type MSV
Chlorinator
Manually controlled



Type ASV Automatic
Chlorinator



Type "O" Dry Chemical
Feeder



W&T
Ammoniator

Chlorinators

Type MSV Vacuum Control Solution Feed Chlorinator—Ideal wherever chlorine feed is at a rate greater than one pound a day.

Type ASV Solution Feed Automatic Vacuum Chlorinator—The MSV made automatic. Actuated by Venturi, float or Pitot tube to follow fluctuations in flows.

Type MSP Semi-Vacuum Solution Feed Chlorinator—For low feed ranges the MSP offers the maximum in accuracy, durability and simple operation.

Type MDP Direct Feed Chlorinator—For direct feed application where an auxiliary water supply is not available. Rugged, accurate and dependable.

Electrolytic Cells—For apparatus to both manufacture and apply chlorine, the W&T Cell is efficient, correct equipment.

Chloro Clock—Accurately feeds predetermined quantities of sodium hypochlorite or similar solutions. For small water supplies and the smaller swimming pools.

Chlorometer—Automatically applies a prepared sterilizing solution. Intended for small water supplies.

Ammoniators

Type MDPA Direct Feed Ammoniator—A self-contained unit specially adapted to handle ammonia gas. Rugged, accurate and dependable.

Type MDWA Direct Feed Ammoniator—Similar to MDPA except available for wall mounting.

Dry Feed Equipment

Type B Feeder—Adapted to high feed ranges. Long recognized as a most satisfactory and dependable machine.

Type O Feeder—For lower capacities, an unusually wide feed range, a ratio of maximum to minimum—as high as 360 to 1—in the case of some chemicals, makes this feeder extremely adaptable and accurate.

GRINNELL COMPANY, INC.

EXECUTIVE OFFICES
PROVIDENCE, R. I.

OFFICES IN PRINCIPAL CITIES

For Grinnell Unit Heaters, Welding Fittings and Pipe Hangers, see Manufacturers' Index

MANUFACTURERS AND CONTRACTORS AUTOMATIC SPRINKLER SYSTEMS

Grinnell has been a leader in automatic sprinkler protection for more than fifty years. Over 30,000,000 Grinnell Sprinklers have been installed and are safeguarding property valued at more than 10 billion dollars. The average loss per fire in Grinnell protected buildings in over 26,000 recorded fires is less than \$300, an estimated saving of over 90% as compared to the average fire loss in similar properties without sprinklers.

Types of Systems

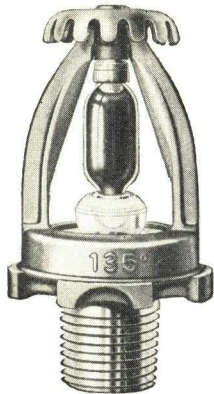
- (1) **Wet-Pipe System**—With water in the pipes under pressure.
- (2) **Dry-Pipe System**—With air in the pipes under pressure.
- (3) **Simplex System**—Using a pressure tank, with air in pipes and the same air pressure in tank and system.
- (4) **"Junior" System**—A wet pipe system for protection of basements of dwellings, small apartment buildings, schools, churches, stores, etc.
- (5) **Deluge System**—With air in pipes under atmospheric pressure and using "open" sprinkler heads.
- (6) **Preaction System**—Similar to 5, but using closed heads.
- (7) **Outside Open Head Systems (Water Curb-tains)**—For protection against exposure fires.

Simplex Sprinkler System

This is a simplified type of system having a pressure tank for a water supply. There is no dry-pipe valve and the same air pressure is automatically maintained in the tank and system.

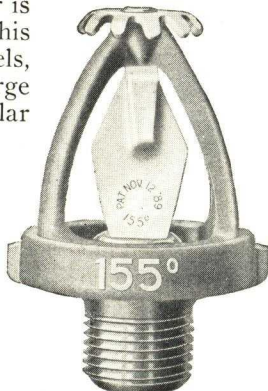
It is especially intended for use in properties where the fire hazard is not severe and where city water is not available. This would include hotels, clubs, institutions, large dwellings, and similar properties.

It is less expensive to install and easy to maintain. The tank can be located in the basement and this is the only part of the system that needs to be heated.



- A—Yoke
- B—Body
- C—Diaphragm
- E—Glass disc
- G—Quartz bulb
- J—Deflector

Quartz Bulb Sprinkler Head
(Patented)



- A—Yoke
- B—Body
- C—Diaphragm
- E—Glass disc
- F—Main strut piece
- G—Hook on strut
- H—Key on strut
- J—Deflector

Solder Type Sprinkler Head
(Patented)

Grinnell Quartz Bulb Sprinkler

This sprinkler was first brought out about ten years ago and it has many advantages over the ordinary solder type sprinkler. An entirely new principle is used, solder is discarded, and in its place a quartz bulb partially filled with a special colored liquid is used. It can be manufactured to operate at any desired temperature and the ordinary or "low" test sprinkler operates at 135° as compared to the 160° solder type. The Grinnell Quartz Bulb Sprinkler is more sensitive or quicker to operate than the solder type and it is to be preferred where prompt operation is necessary because of severe fire hazard or danger of fire spreading quickly.

This new type is not subject to failure from corrosion as is the solder type. The bulb itself is non-corrosive and the rest of the sprinkler can be lead coated or otherwise protected. Chemical and other plants where severe corrosive conditions exist can now have sprinkler protection because of the Grinnell Quartz Bulb Sprinkler Head. It also is not affected by "loading" or "gumming" from dust, varnish fumes, paint, etc.

Grinnell Quartz Bulb Sprinkler Heads are specified in many cases because of their unusually attractive appearance.

Over a million Grinnell Quartz Bulb Sprinkler Heads have been installed and experience has shown that not only are they preferable for general use, but are especially desirable where quick action is necessary or where the sprinklers are subject to corrosive influences, loading, or gumming.

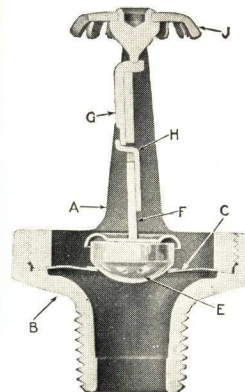
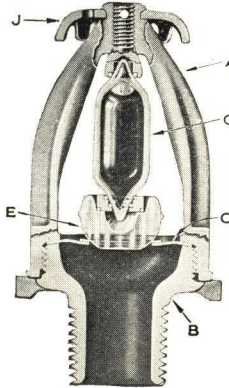
Installation

Grinnell Automatic Sprinkler Systems are factory-assembled to blue prints, fittings being made-on as far as possible by machinery. The result is that the equipment is delivered ready for quick and botherless installation by our highly trained erecting crews.

Grinnell "Junior" Sprinkler Systems (see "4" under "Types of Systems") are sold and installed exclusively by our Authorized Agencies, who are local plumbing and heating contractors.

Designs and Estimates

Inquiries addressed to the executive offices of GRINNELL COMPANY, INC., 277 West Exchange Street, Providence, R. I., or to any of the offices will immediately receive the attention of the engineering staff, who will promptly furnish expert advice with designs or estimates as required, without cost or obligation.



MANUFACTURING EQUIPMENT & ENGINEERING CO.

ESTABLISHED 1905

Sanitary Drinking Fountains and Washbowls FRAMINGHAM, MASS.

BRANCHES AND AGENCIES IN PRINCIPAL CITIES

MEECO SANITARY DRINKING FOUNTAINS, COOLERS AND COMBINATIONS



No. 929

Meeco Cooler Fountain
(See construction details at right)

Bowl—Heavy cast iron, vitreous enameled; octagon shaped. Solid vitreous china bowl may be had at slightly increased prices.

Bubbler—New Meeco Fig. 900 china top, chromium plated, adjustable, positive in action.

Brass Strainer—Chromium plated, standard equipment.

Cover, Top, Bottom and Base—Cast iron. Cover has padlock attachment to prevent tampering with ice chamber or ice. Insulated all around with 1¾-in. thickness of granulated cork.

Cooling Coil—55 ft. of ½-in. outside diameter seamless copper tubing in regular model, and 110 ft. in double capacity model.

Ice Capacity—Regular models, approximately 80 lbs.; double capacity models, 120 lbs.

Supply and Waste Pipes, and Automatic Tank Overflow—Standard equipment, and are concealed between walls of cooler.

Tank and Coil Guard—No. 18 gauge steel, galvanized after fabrication.

Hardware, Finish, etc.—All exposed fittings chromium plated.

Olive green enamel, standard finish.

Optional Equipment—Slant stream, guard bowl.



No. 902

Pedestal Type Fountain

Cast iron bowl is vitreous enameled. Fittings are chromium plated. Bubbler has china top. Standard height 40 in. Other heights furnished on order.



No. 911



No. 919

Double Capacity Fountain

For installations where the demand is extra heavy. This fountain has 110-ft. copper tubing which keeps a double amount of water continually being cooled. Ice capacity approximately 120 lbs.

Wall Type Fountain

Cast iron bowl, vitreous enameled. Chromium plated fittings. Bubbler with china top. Also furnished as guard-bowl with slant stream bubbler. May be used in connection with cooling tank.

MEECO SANITARY WASHBOWLS

Economy Washbowls (Patented)

Have common water supply and common waste. Only one trap per battery is necessary even when as many as 20 bowls are used.

A 1-gal. bowl is usually furnished but a 2½-gal. bowl can be provided.

Shipped knocked down, crated.

Victory Washbowls (Patented)

Have common water supply, common waste and common vent. Each bowl has individual trap. Economical in first cost and installation.

Shipped largely erected, greatly reducing cost of installation. All that is necessary is to connect water supply, vent and waste.



Fig. 110 Economy Washbowls, Double Battery

Bowl holds 2 gal. of water. Extremely simple in construction, staunchly built for long service and handsome in appearance.



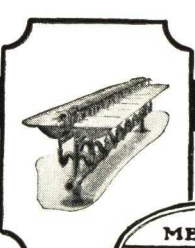
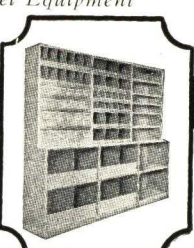
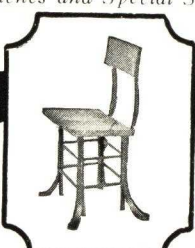
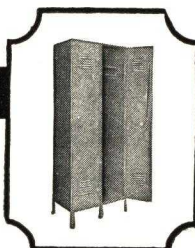
Fig. 114 Double Battery of Victory Washbowls

All piping galvanized iron unless otherwise specified

How Our Washbowls Are Furnished

- (1) In single or double batteries.
 - (2) For hot and cold or one temperature of water.
 - (3) With vitrified porcelain enameled, plain iron or galvanized iron bowls.
 - (4) With compression or self-closing bibbs, Economy bowls being also furnished with plain nozzle.
- All piping for Economy bowls black iron and for Victory bowls galvanized iron, unless otherwise specified.

Other Meeco Products Include Steel Lockers, Shelving, Chairs, Tables, Counters, Boxes, Cabinets, Work Benches and Special Steel Equipment



Steel Industrial Equipment — Lockers — Washbowls — Fountains — Chairs — Shelving



PURO SANITARY DRINKING FOUNTAIN CO.

Manufacturers of Drinking Fountains and Coolers

HAYDENVILLE, MASS.

PURO

TRADE-MARK REGISTERED

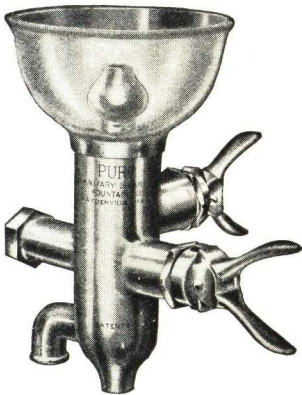


Fig. 1
Puro Combination Faucet and Drinking Fountain
Especially adapted to factories and mills

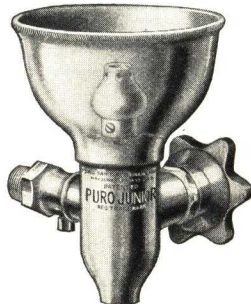


Fig. 2
"Puro Junior" Fountain
With non-squirt tip and 6-arm ball bearing handle. Unexcelled for all-round service

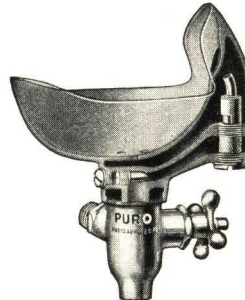


Fig. 24
Puro Side Stream Fountain
For all public places where sanitation is paramount. Can not be contaminated



Fig. 40
Puro Push Button Fountain
A popular type of push button fountain. Furnished with rock china, or metal bowl

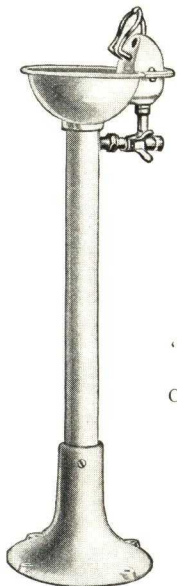


Fig. 15
"Liberty" Pedestal Fountain
Cast iron base with enameled bowl

Puro Fountains

The fountains shown on this page are only representative of our large and complete line of drinking fountains and appliances.

Full descriptive catalogue and prices will be gladly furnished on request.



Fig. 100 WGH
Puro Combination Fountain and Faucet
An extremely attractive combination fountain with glass holder attached

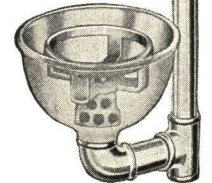


Fig. 100 WGH

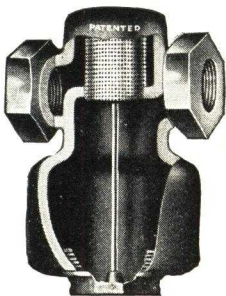


Fig. 115
Puro Automatic Self-cleaning Water Filter
This is essential to producing clean water as it removes minute particles of foreign matter so often found in the supply mains



Fig. 8
Puro Coolers

These are sturdily constructed throughout and consist of a double shell cork insulated tank with galvanized cooling coil. The base is of cast iron and is drilled for bolting to the floor. Coolers can be supplied with almost any type fountain to specification

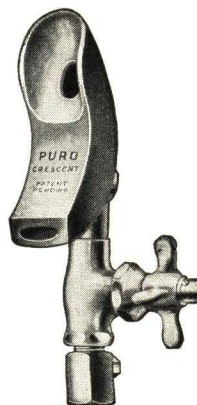
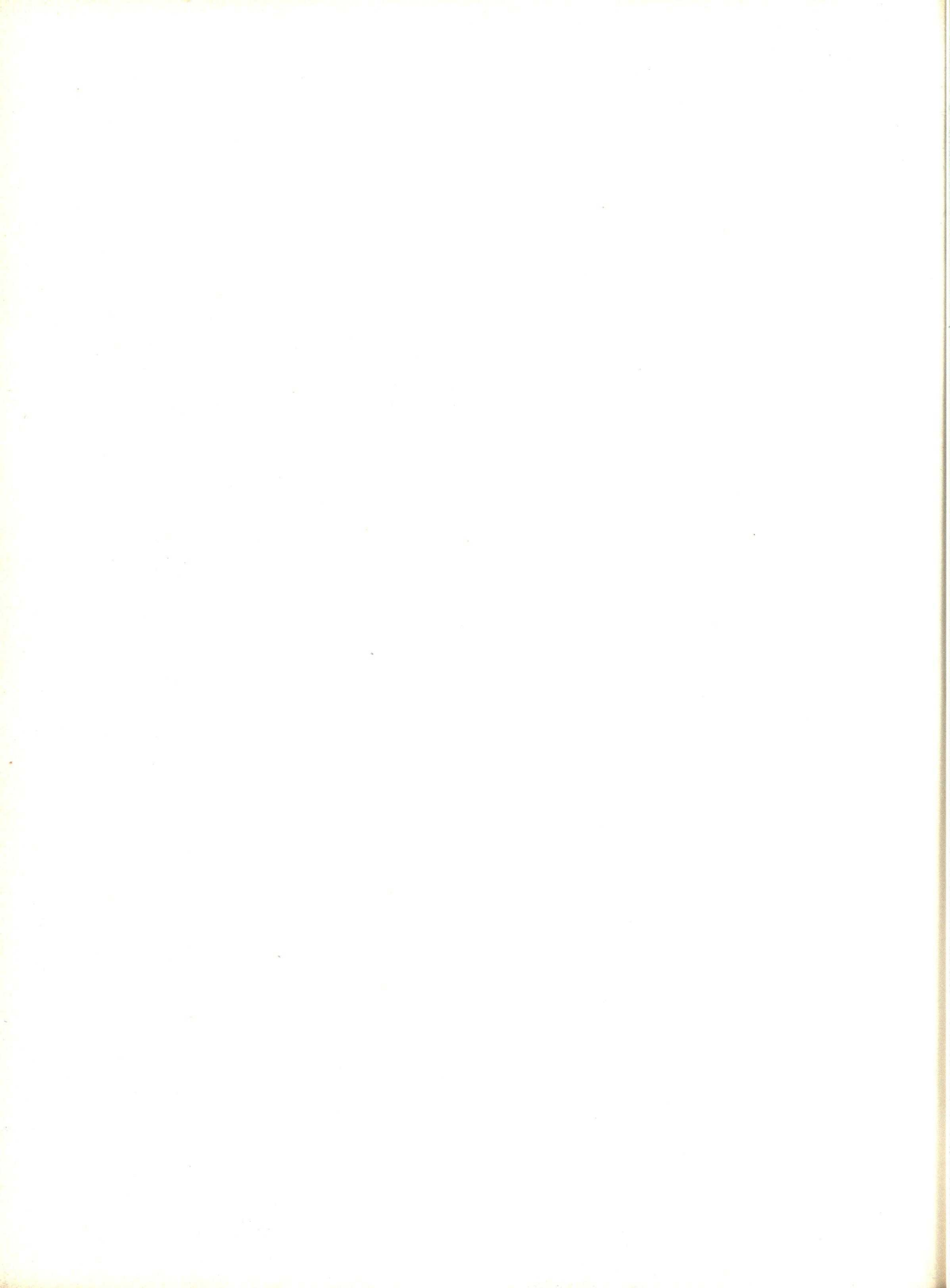


Fig. 200
Puro Crescent Fountain Head

An inexpensive model. Embodies the most advanced principles of sanitary drinking water supply



Fig. 100
Puro Combination Fountain and Faucet
A beautiful combination type. Has side stream and large bowl



**INDUSTRIAL HEATING,
VENTILATING
AND
AIR CONDITIONING**

BURNHAM BOILER CORPORATION

Makers of Iron and Steel Heating Boilers, Radiators and Radiator Valves
IRVINGTON, N. Y.

BRANCH OFFICES

BALTIMORE, MD., 2400 Linden Avenue
BOSTON, MASS. (Cambridge), 195 Albany Street
CHICAGO, ILL., 1038 South Kolmar Avenue

LANCASTER, PA., Dillerville Road
PHILADELPHIA, PA., 31st and Jefferson Streets
PITTSBURGH, PA., 301 Brushton Avenue

QUEENS VILLAGE, L. I., N. Y., 222nd Street
and Long Island R. R.
SPRINGFIELD, MASS., 153 Plainfield Street

PLANTS: LANCASTER, PA., ELIZABETH, N. J., ZANESVILLE, OHIO

Whatever the Fuel or Firing Requirement There's a Burnham Boiler

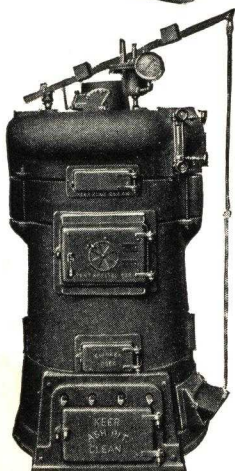
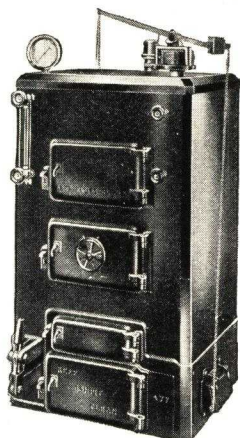
Also

High Pressure Hot Water
Supply Boilers; Laundry Stoves;
Tank Heaters; Steel Storage
Tanks; Air and Vacuum Valves.

Left:

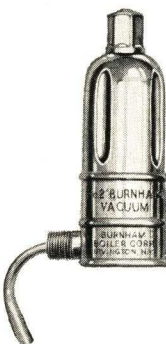
Jacketed Boiler

Our regular water
tube type boiler,
jacketed with heavy
thoroughly insulated
jacket.



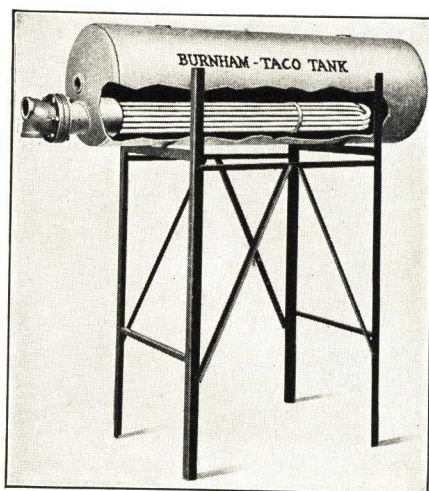
Round Sectional

Particularly adapted for
small and medium size
residences, small stores,
two-apartment buildings,
etc.



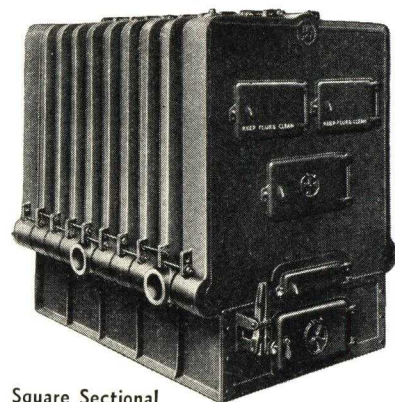
Air and Vacuum Valves

A high quality
complete line for
every purpose.



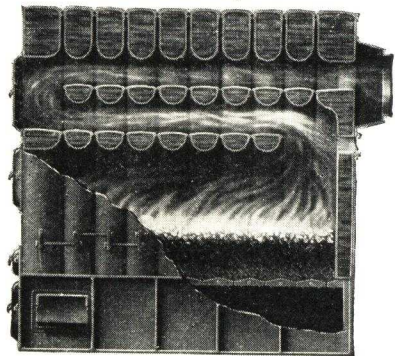
Burnham-Taco Tank

Combining water heater and storage tank.



Square Sectional

17, 21, 27, 36, 38 and 50-in. grates. Ex-
ceptionally high grade boilers, suitable for
coal, oil or gas fuel. Short tie bolts make
sectional replacements easy.



Tube Type Smokeless

The smoke is mixed with air at the rear
of the primary combustion chamber, assur-
ing complete combustion of the smoke and
gases before they reach the end of the
3-way fire travel.



Left:

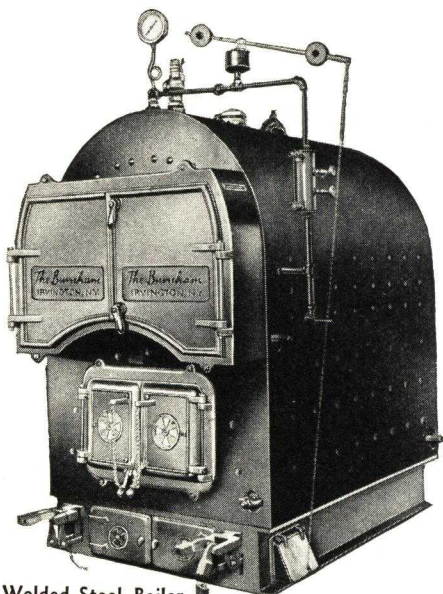
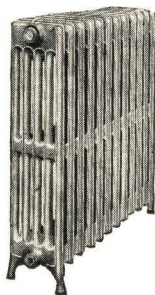
Burnham Radiators

The all-purpose radi-
ator, taking one-third
less space than others,
for same rating. 3-tube
is but $3\frac{1}{4}$ in. deep.
4-tube is $4\frac{1}{16}$ in. deep.

Right:

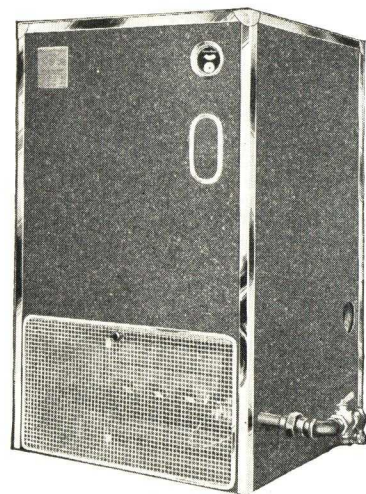
Burnham Fero Radiators

Cast iron radiators
designed to give a
maximum ratio of air
space to radiating sur-
face. Supplied in
three, four, five, six
and seven tube pat-
terns, all standard
heights.



Welded Steel Boiler

Heating, hot water and incineration can be
supplied in this boiler for oil or coal firing.
Maximum steam working pressure, 15 lbs. Do-
mestic and commercial sizes.



Burnham-Simplex Gas Boiler

Controls completely enclosed by neu-
tral color jacket. Built to A.S.M.E.
Code and passed the new rigid require-
ments of the A.G.A.

BUFFALO FORGE COMPANY

"Air Engineers for Over Fifty Years"

484 Broadway, BUFFALO, N. Y.

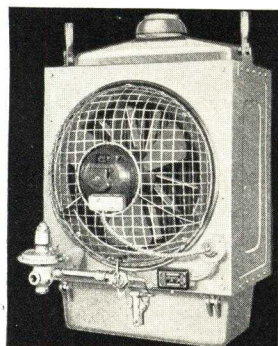
BRANCH OFFICES

ALBANY, N. Y., 414 Standard Building, H. S. Johnson
ATLANTA, GA., 404 Title Building, E. T. Gorbandt
BALTIMORE, MD., 1302 Munsey Building, R. T. Harmon
CHARLOTTE, N. C., P. O. Box 376—J. W. Fraser & Co.
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CLEVELAND, OHIO, 368 Rockefeller Building, T. A. Weager
DALLAS, TEX., 2710 Live Oak Street, W. J. Allan
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INDIANAPOLIS, IND., 725-727 Circle Tower, I. D. DeHaven
KANSAS CITY, MO., 217 Dwight Building, L. R. Chase
KITCHENER, ONT., CANADA, Canada Pumps, Ltd., A. S. Capwell

KNOXVILLE, TENN., P. O. Box 1035, 315 Empire Building, C. F. Sexton
LOS ANGELES, CAL., 610 Pershing Square Building, P. R. Adrianse
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PITTSBURGH, PA., 912 Fulton Building, H. L. Moore
SAN FRANCISCO, CAL., Herberts Moore Machinery Co., 140 First Street, J. G. Scott
ST. LOUIS, MO., 1569 Arcade Building, J. W. Cooper
SEATTLE, WASH., 2719 First Avenue, South, A. T. Forsyth
TOLEDO, OHIO, 1817 No. 13th Street, C. M. Eyster
WASHINGTON, D. C., 403 Commercial National Bank Building, G. S. Frankel

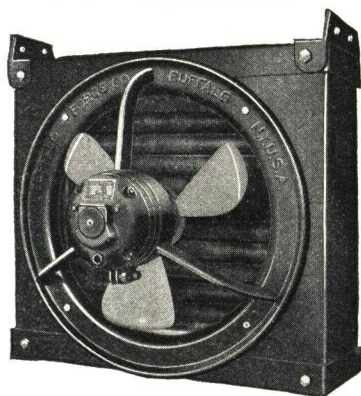
Products

HEATING and VENTILATING EQUIPMENT, including: Unit Heaters, Multiblade Fans, Pipe Coil Heaters, Buffalo Air Washers, Buffalo Unit Air Washers, Buffalo Unit Coolers, Drying Equipment, Mechanical Draft Fans, Air Preheaters, Exhaust Fans, Blowers, Dust Collectors, Disc Fans, Spray Nozzles.



Buffalo Gas Unit Heaters

Made in suspended and floor types, two sizes each. Total capacity, 75,000 to 450,000 B.t.u. input per hour. All models equipped with full automatic safety features. Advantages are: low first cost, by eliminating boiler room, fuel storage, auxiliary equipment and necessity for fireman or engineer; easy installation; cleanliness; automatic control; etc. Write for bulletin.

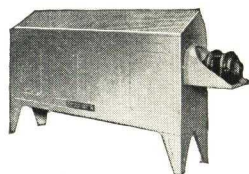


Buffalo Improved Breezo-Fin Units Model "B"

Recommended for high or low pressure steam—ceiling or wall mounting. Aerofin coils, improved three-blade fan, adjustable louvers and die-stamped casings featured in all eight sizes.

Buffalo Highboy and Lowboy Unit Heaters

These large capacity units are made in five sizes, for floor, wall or ceiling mounting. Aerofin steam coils are used and air is drawn through these coils by two or more quiet centrifugal fans. "Lowboy" Unit shown here has so-called screen top, other models usually supplied with overhead outlets which distribute heated air through working zone.



Buffalo builds several types of unit heaters to fit the many requirements of various types of buildings. When a Buffalo Engineer makes recommendations, you are sure of an unbiased selection.

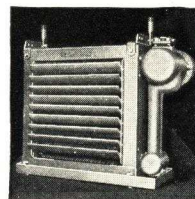


Breezo Fans

For all exhausting and ventilating service where no duct work is required. Air handling capacity unsurpassed by any other fan of corresponding size and power consumption. Complete range of sizes. All-steel construction, with fully enclosed self-lubricating motors.

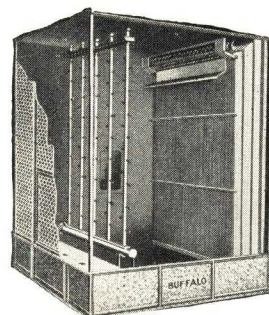
Buffalo Unit Coolers

Chilled air for warehouse, packing room, fur storage, or fruit or meat shops is now inexpensive and easily installed. Buffalo Unit Coolers are made for ammonia, brine, cold water or other refrigerants, in floor and suspended types. Because they are compact, efficient and inexpensive, they merit your consideration. Bulletin 2882 gives complete details, with installation data.



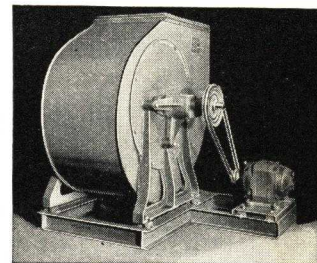
Buffalo Air Washers

Buffalo Air Washers embody a quarter century leadership and have numerous features, outstanding of which are: eliminators in one piece and demountable; flooding nozzles guarantee wet scrubbing surfaces; suction screen extends width of tank; maximum contact between air and water spray.



Buffalo "Limit-Load" Conoidal Fans with Silent Floating Base

The engineer who is interested in fan performance gets a thrill out of this combination—the new Buffalo "Limit-Load" high-efficiency, non-overloading ventilating fan, mounted on the latest development of Buffalo engineers—the silent, insulated floating fan base (patents applied for). Wherever you have a job that requires a quiet fan—specify and insist upon the "Limit-Load." And—where you want an outfit as nearly noiseless as possible—install a "Limit-Load" on a Buffalo Silent Base and you have absolutely the last word in efficient, silent ventilation.

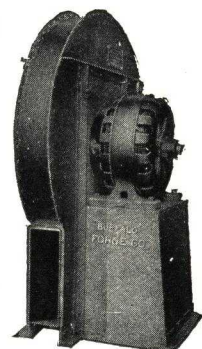


Buffalo Type "R" Fans (Right)

Heavy steel plate fans designed and built to meet particular requirements of individual installations. Specially suited for blowing gas generators, conveying pulverized coal and furnishing air for combustion, and blast to oil and gas burners.

Buffalo Volume Fans

Cast iron construction, for handling smoke, fumes and dust, ventilating, forge and furnace blowing, etc. Heavy dust-proof ball bearings. Reversible as to discharge and interchangeable for clockwise or counterclockwise rotation.



Buffalo Mechanical Draft Apparatus

Buffalo Forced and Induced Draft Fans have kept pace with the rapid strides in modern boiler room efficiency. Rugged and reliable with improvements in efficiency; stronger and better balanced rotors for the higher peak loads; liners and welded construction to combat the erosion of powdered coal—these are some of the things obtained in Buffalo Fans.

GRINNELL COMPANY, INC.

EXECUTIVE OFFICES
PROVIDENCE, R. I.

OFFICES IN PRINCIPAL CITIES

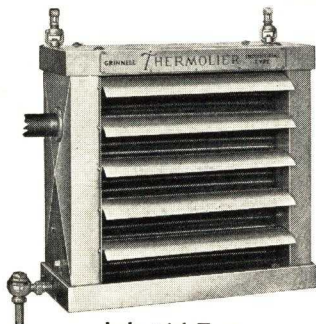
For Automatic Sprinkler Systems, Welding Fittings and Pipe Hangers, see Manufacturers' Index

UNIT HEATERS AND UNIT COOLERS

Grinnell Thermolier

(Patented)

Industrial and Factory Types—125 Lbs. W.S.P.

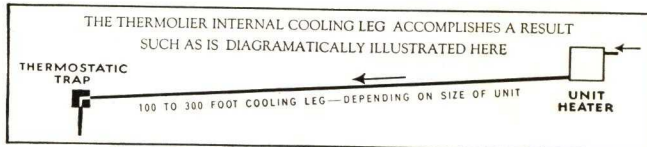


Industrial Type

Thermolier, the Grinnell development in "unit heaters," is a ruggedly built unit whose efficiency and dependability have been proved by actual performance in field service. Thousands of them are installed in industrial buildings and commercial structures of all types of occupancy.

Thermolier has 14 points of superiority, the most outstanding of which is the internal cooling leg built right into the unit, an exclusive Thermolier feature. See drawing below.

Radiation is from brass-finned seamless copper U-tubes rolled into a cast-iron tube sheet. No solder is used for strengthening joints and there are no flat horizontal surfaces to catch dirt.



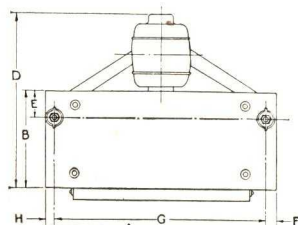
Units may be controlled manually or automatically, singly or in groups. Installation and piping are extremely simple and inexpensive, hence the unit may be moved from one location to another at small cost if found desirable on account of changes in building or occupancy. Furnished in sizes as listed.

Thermoliers provide maximum distribution of heat without objectionable drafts.

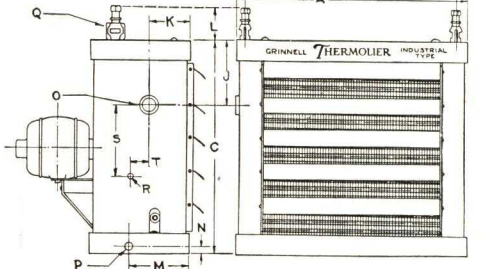
CAPACITIES

60° F. entering air temperature
5 lbs. steam pressure

Model Nos.	B.t.u. per hour	Model Nos.	B.t.u. per hour
100	24,500	100A	18,000
200	32,900	200A	24,000
300	82,300	300A	56,900
400	110,800	400A	73,400
600	159,500	600A	105,000
800	199,100	800A	123,000
1200	311,000	1200A	207,000
1600	388,000	1600A	246,000



Data Book covering other pressures and temperatures and complete installation information on application. Address GRINNELL COMPANY, INC., 277 West Exchange Street, Providence, R. I.



DIMENSIONS IN INCHES—INDUSTRIAL TYPE

Models	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	S	T
100-200	14 1/4	8 1/2	11 3/4	*15	2 3/8	1 1/2	12 5/8	1 1/2	2 3/8	3 1/4	2 5/8	5 1/4	1 1/2	1 1/4	1 1/2	1 3/8	4 1/2	2 1/2
300-400	21 1/4	10 1/2	18 1/2	*17	2 3/8	1 1/2	19 1/2	1 1/2	2 3/8	3 1/4	2 5/8	6 5/8	1 1/2	1 1/4	1 1/2	1 3/8	7 1/2	2 3/8
600-800	27 3/4	11 1/2	25 1/2	*21	3 1/8	1 1/2	24 1/2	1 1/2	2 3/8	4 1/4	3 1/8	8 1/2	1 1/2	1 1/4	1 1/2	1 3/8	10 1/2	2 5/8
1200-1600	36 1/2	12 1/2	32 1/2	*25	4 1/4	1 1/2	33 1/2	1 1/2	2 3/8	5 1/4	4 1/4	10 1/2	1 1/2	1 1/4	1 1/2	1 3/8	12 1/2	3 1/4

*This dimension varies slightly with different motors.
O = Supply. P = Return. R = 3/8-in. Air Vent Outlet—can be bushed as required.

†Adjustable Swivel Coupling (furnished with Thermolier) tapped standard bolt thread.

‡Outlets bushed to pipe size next smaller than indicated in table.

Note: Models 600 and 800 have 5 louvers placed as shown on above sketch. Models 100-200 and 300-400, have 4 louvers; 1200-1600, 6 louvers.

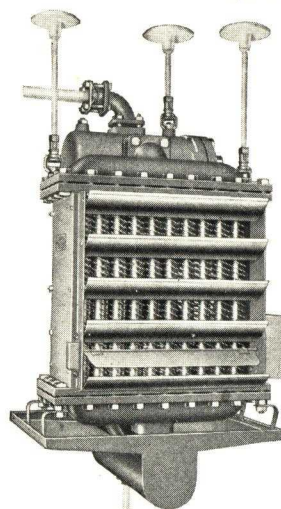
All essential dimensions of the Industrial Type, as given in table above, will also apply to the Factory Type. "A" Units have same dimensions as Standard Units.

Specifications—

Fan—Grinnell special of rugged construction. **Motor**—heavy duty, over-size, enclosed, moisture-proof. **Housing**—Copper on Industrial Type with rubbed lacquer finish; steel on Factory Type finished in gray duco. **Frame**—Heavy pressed steel, providing rugged support for motor and fan. **Special Features**—Adjustable swivel hanger rod couplings; louvers rigid, but easily adjustable; integral cooling leg insuring perfect drainage through one 1/2-in. trap on Models 100 and 200, 3/4 in. on Models 300 to 800, 1 in. on Model 1200, 1 1/4 in. on Models 1600 for pressures up to 25 lb. For pressures not exceeding 125 lb., a thermostatic trap of proper construction can be used and should be attached directly to the unit; same sizes as above except a 1/2-in. trap on Models 300 and 400, 1-in. trap on Model 1600.

Grinnell Unit Cooler

(Patents Applied For)



Grinnell Unit Cooler with Automatic Defroster and Liquid Level Control

The Grinnell Unit Cooler is built to meet the most exacting needs of the refrigerating industry. Designed by experienced refrigerating engineers it is a positive improvement over pipe coils or radiators for every variety of commercial cooling or refrigerating work. It is used with direct expansion ammonia, brine or other refrigerants.

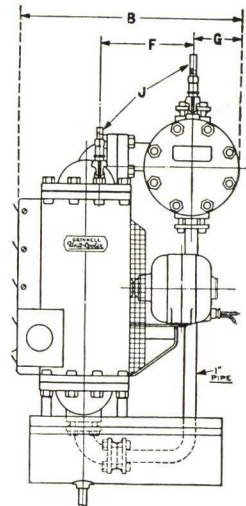
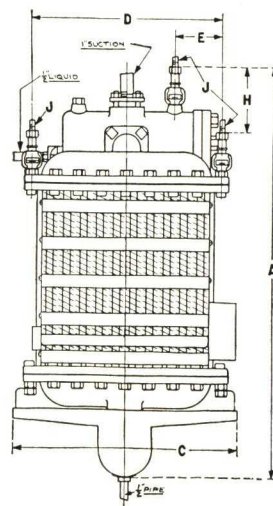
Two exclusive outstanding features of the Grinnell Unit Cooler are the automatic defroster and the liquid level control (the latter furnished as a part of the unit when a volatile liquid refrigerant is used).

Laboratory and field service have positively demonstrated that the Grinnell Unit Cooler has these inherent advantages:

Savings in first cost, erection cost, space for capacity required and electrical consumption—gives quicker cooling, has positive and continuous air circulation, defrosts automatically, has extreme refrigerating flexibility to meet varied requirements, simplifies automatic control and reduces maintenance expense.

Ruggedly built with tubes, tube sheets, headers, joints, bolts, housing, etc., processed to prevent rusting.

A booklet which includes complete description, illustrations, capacity charts, etc., sent upon application.



DIMENSIONS IN INCHES

A	B	C	D	E	F	G	H	J
42	23	23 1/2	20	5	9 1/8	5	6 3/4	5 5/8

L. J. WING MFG. CO.

WORKS
NEWARK, N. J.

53 Seventh Avenue, NEW YORK, N. Y.

BRANCH OFFICES IN
PRINCIPAL CITIES

Wing Products

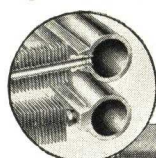
WING FEATHERWEIGHT UNIT HEATERS and PROCESS HEATING UNITS; UTILITY HEATERS; WING-SCRUPLEX SAFETY VENTILATING FANS; FOG ELIMINATORS; WING-SCRUPLEX EXHAUSTERS; WING FORCED DRAFT BLOWERS, TURBINE or MOTOR DRIVEN; STEAM TURBINES; WING SAFETY COOLING FANS.

Wing Featherweight Unit Heaters

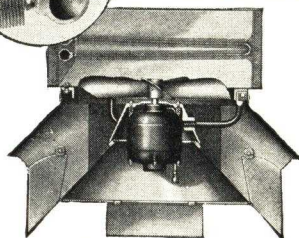
The original and exclusive features of Wing Featherweight Unit Heater design—their light weight, the vertical downward discharge of the heated air, and multiple discharge outlets which step up the velocity of the air leaving the heater—are directly responsible for definite economies in the actual cost of industrial plant heating and in the cost of the equipment itself.

Their light weight permits easy overhead suspension near the roof or ceiling. The high velocity multiple discharge outlets insure projection of the heated air to the working level, and the fact that they draw air from the highest points in the building prevents the accumulation of overheated air in the upper spaces, where it is wasted by rapid transmission through the roof.

New Wing Featherfin Heating Element—(Tested to 1000 Lbs. Pressure)—This new element, used in all Wing Featherweight Unit Heaters is extremely light in weight and by simple variations of the heating surface any desired final air temperature may be obtained with any given steam pressure. Successful unit heating requires the circulation of large volumes of air at relatively low temperatures. Assemblies of the element, therefore, have been standardized for steam pressures of 5, 40, 70, 100 and 130 lbs., all producing the same low final air temperatures. Bulletin H-4 contains complete data.



Detail of Wing Featherfin Heating Element Showing Compression Union Tube Connection



Type LC Unit

Illustration in Cross Section. In this type the fan and motor being below the heating element permits installation close to roof or ceiling

Type HC Unit

In this type the fan and motor are above the heating element, permitting any one of a variety of discharge outlets to be used; selection to be made to suit individual conditions. Outlet shown is design No. 7



Built to discharge horizontally as shown, or vertically upward or downward, with intake at top, bottom, or either side, or any combination of these.

Provided with weatherproof housing for roof installation. For acid fumes, all exposed parts can be supplied in Monel metal.

Bulletin E-8 contains complete data.

Wing-Scruplex Safety Ventilating Fans

The new safety feature of the Wing-Scruplex Fan consists of a heavy welded steel guard, welded directly to and forming an integral part of the fan frame. It is designed to provide perfect safety without reducing the efficiency of the fan.

The true screw design of the Wing-Scruplex Safety Fan wheel delivers air in straight and parallel lines at extremely uniform velocity over the entire area. Eddy currents are therefore reduced to a minimum, the result being quiet, smooth and efficient operation.

Sizes, 10 in. to 60 in. diameter. Motor, pulley, or steam turbine driven. Bulletin F-5 contains complete data.



Wing Forced Draft Blower System

This equipment is extensively employed:

(1) To take advantage of the low-cost fuels available;

(2) To step up the capacity of boilers where loads fluctuate or where the draft is inadequate.

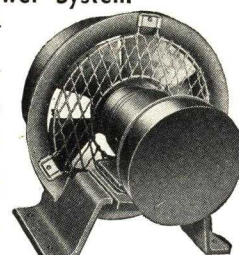
Easily installed on any boiler, it makes possible the use of the small sizes of anthracite coal (buckwheat, rice, screenings, etc.) or slack coals, affording savings of 40% to 60% as compared with domestic sizes. The cost of the complete installation is usually paid for out of savings from the first heating season's operation.

The Wing System not only increases boiler capacity but raises steam pressure much more quickly. With its automatic controls, the fireman can maintain a comfortable, uniform temperature throughout the building, even on the coldest days with far less attention than with natural draft.

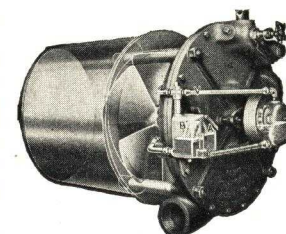
Wing Blowers are of the propeller type, affording low air velocities, quiet operation, and even distribution of air. Motors are totally enclosed and of variable speed design. Speed regulating rheostats are conveniently located near the boiler front, so that fireman can easily control his draft as he watches his fire.

Wing Forced Draft Systems have been installed in thousands of schools, hospitals, apartment houses, office buildings, banks, churches, etc.

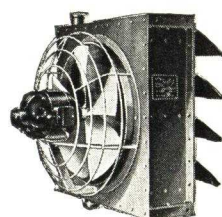
For high pressure boilers (stoked, hand-fired, or oil-fired) Wing Turbine Blowers offer a simple and inexpensive forced draft installation. Placed in the boiler walls, they eliminate costly ducts and excavations, making initial cost low while giving maximum economy and steaming capacity.



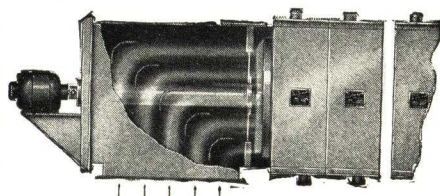
Motor-Driven Blower



Turbine Blower



Wing Utility Unit Heater
Bulletin U-3



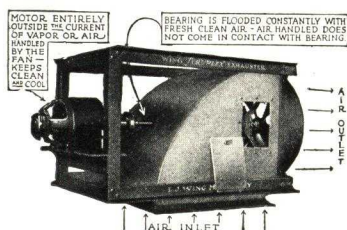
Wing Featherfin Process Heating Unit
Bulletin P-2

Wing-Scruplex Exhauster

This unit is in reality a combination of the well-known Wing Scruplex Fan and a housing of convenient form. Being designed as an elbow, it is conveniently used as such in any run of duct.

The motor is outside the housing where it keeps clean and cool, and is convenient of access. Driving shaft is extended through housing, and the interior bearing being mounted in a tube is constantly flooded with clean, cool air.

Made in many sizes, 500 c.f.m. to 50,000 c.f.m., at pressures up to 1 in. static.



MONASH-YOUNKER CO., INC.

Guaranteed Thermostatic Radiator Traps and Type "C" Elements

1315-1321 West Congress Street, CHICAGO, ILL.

Making Obsolete and Defective Radiator Return Line Traps Efficient

The Only Specialized Business of Its Kind

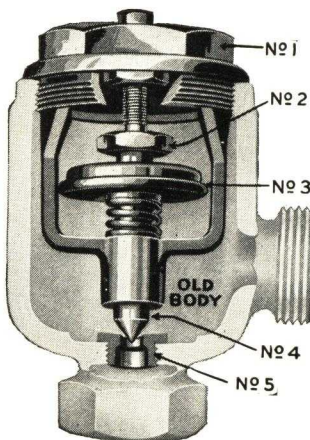
For many years we have been revamping obsolete or defective radiator traps, making them better than when new and guaranteeing the diaphragm in the trap against upkeep costs for ten years.

Monash Thermostatic Type "C" Elements have the same mechanical features and assembly parts as our regular traps, with only such minor changes as are necessary to adapt them to use in old radiator trap bodies. They can be used to reconstruct faulty and inefficient radiator traps, either float or thermostatic types.

They have been in use for more than nineteen years and are guaranteed in writing for ten years. They save fuel and raise the efficiency of the heating system. Easily installed by the plant engineer, without special tools, requiring only a few minutes time for each trap.

Monash Thermostatic Diaphragm

The heart of the Monash Thermostatic Type "C" Elements, the diaphragm, is as sensitive to the various changes of temperature as the most delicate instrument, yet is so sturdy in construction that we do not hesitate to guarantee it in writing for a period of ten years.



Revamping Old Radiator Traps with Monash Type "C" Elements

The cover (No. 1) is cast in one piece with the guide, which permits the plunger (No. 4) to be always in perfect alignment with the seat (No. 5) when closing. The diaphragm (No. 3) is held securely in place between the adjusting screw (No. 2) and the plunger (No. 4). The diaphragm is therefore a separate and independent unit, not attached to any part of the trap body, permitting the diaphragm to be removed without disturbing the adjustment.

A Word to Heating Plant Engineers

If you will send us an old ($\frac{1}{2}$ -in.) radiator trap, complete with nut and tail piece attached, and if it is so constructed, we will install one of our Monash Thermostatic Type "C" Elements into the trap body and return the reconstructed trap to you, postpaid, for test.

Should your trap be so constructed that it cannot be revamped, we can replace it with a complete Monash Ten-Year-Guaranteed trap that will fit in its place, so that

no pipe fitting will be necessary. This will give you an opportunity to learn at first hand all about the advantages of Monash Thermostatic Type "C" Elements in old radiator traps, or the complete Monash Thermostatic Radiator Traps.

Monash Thermostatic Traps

Guaranteed for Ten Years

All Monash Thermostatic Traps and Type "C" Elements are tested before shipping and are backed by a written guarantee for ten years.

Monash Thermostatic Radiator Traps

For vapor or vacuum heating systems in homes, apartments, schools, churches, office buildings, hospitals, etc.

They are especially suited to these heating systems because they are noiseless in operation.

No. 35-A Traps—Furnished in angle type only.

No. 35-B Traps—Furnished in angle, right, left and straight-way type.

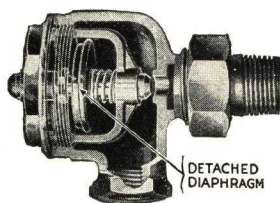
No. 36-A and 36-B Traps—Designed for use where traps of larger capacity are required; can be furnished in angle type only. *All for pressures up to 10 lb.*

Distinctive Features of Monash Thermostatic Element

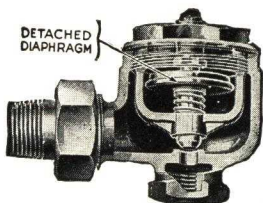
The thermostatic element known as the diaphragm in our trap is a separate and independent unit. The expansion of the diaphragm exerts a direct pressure on the plunger, which is held in a guide, having perfect alignment with the seat, thus overcoming the objectionable features of traps where the plunger must locate itself. The construction of Monash Traps allows the free passage of sediment, scale or oil into the return line.

CAPACITY AND LIST PRICES MONASH TRAPS

No.	Size, in.	Radiation, sq. ft.	Water per hour, lb.	Net wt., lb.	List price, f.o.b. Chicago
35 A and B	$\frac{1}{2}$	200	65	1.75	\$ 5.50
36 A and B	$\frac{1}{2}$	350	108	2.50	7.00
36 A and B	$\frac{3}{4}$	500	160	2.50	8.00
36 AX and BX	$\frac{3}{4}$	800	350	2.50	10.00

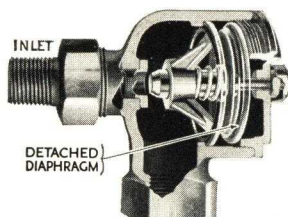


No. 35-A

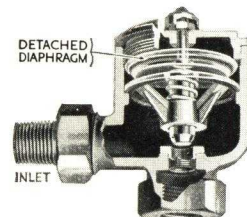


No. 35-B

Monash No. 35 Radiator Traps



No. 36-A



No. 36-B

Monash No. 36 Radiator Traps

THE POWERS REGULATOR CO.

40 Years of Specialization in Temperature Control

GENERAL OFFICES AND FACTORY:

2783 Greenview Avenue, CHICAGO, ILL.

GENERAL EASTERN OFFICES:

231 East 46th Street, NEW YORK, N. Y.

CANADIAN POWERS REGULATOR CO., LTD., 106 Lombard Street, TORONTO, ONT.

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WINNIPEG

Products

Systems of automatic temperature and humidity control for heating, ventilating, and air conditioning equipment.

Automatic temperature and humidity regulators for industrial processes.

Mixing Valves—thermostatic and pressure equalizing valve types for automatically mixing hot and cold water, or steam and cold water, capacities 3 to 1700 gals. per min.

High pressure steam traps, dial indicating thermometers, and pressure reducing valves.

Quick Service

With competent engineers in 43 cities, we are able to give prompt and intelligent service whenever necessary. Forty years of specialization in Automatic Temperature Control serving the leading industrial firms and manufacturers of air conditioning equipment, has given us a wealth of knowledge and experience from which you can draw in selecting the proper type of control for any purpose.

Style K Thermostat
(Compressed air type)

Style D Thermostat
(Compressed air type)

Duct Thermostat
(Compressed air type)

Hygrostat
(Compressed air type)

No. 14 Temperature Regulator
(Compressed air type)

No. 21 Temperature Regulator
(Compressed air type)

Style K Rigid Stem Thermostat
(Compressed air type)

Thermostat and Hygrostat Combination
(Compressed air type)

Style K Thermostat with Flexible Tubing and Bulb
(Compressed air type)

No. 16 Temperature Regulators for Unit Heaters, Ventilating Units, Brine Coils, etc.
(Self operated)

All Metal Radiator Valve
(Compressed air operated)

All Metal Diaphragm Valve
(Compressed air operated)

No. 11 Temperature Regulator for Hot-water Heaters, etc.
(Self operated)

No. 15 Temperature Regulator for Dryers, Ventilating Units, etc.
(Self operated)

Thermostatic Radiator Valve
(Self operated)

Compressed Air Relay for Amplifying Action of Thermostats and Regulators

Compressed Air Switch for Manual Operation of Diaphragm Valves and Dampers

All Metal Dampers and Motors
(Compressed air operated)

AMERICAN BLOWER CORPORATION

GENERAL OFFICES
DETROIT, MICH.

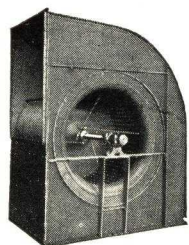
FACTORIES: DETROIT, MICH., and CINCINNATI, OHIO
SALES AND ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

PRODUCTS

HEATING, VENTILATING, COOLING, PURIFYING, HUMIDIFYING, DEHUMIDIFYING, DRYING, MECHANICAL DRAFT and DUST COLLECTION EQUIP-



MENT; FANS and BLOWERS for all purposes; VERTICAL SELF-OILING STEAM ENGINES; STEAM TRAPS.



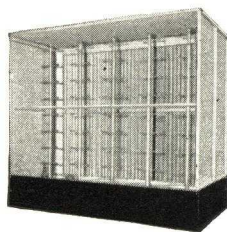
Series 30 Fan

Sirocco Multiblade Fans and Blowers

The standard wherever fans are required for heating, ventilating, cooling, air conditioning, drying, mine ventilation and exhaust systems.

High volumetric and mechanical efficiency. Driven by belt, steam engine, motor or turbine. 30 to 400,000 cu. ft. per minute at pressures up to 15-in. static.

Bulletin A-101.



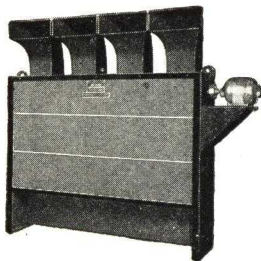
Sirocco Air Washer

Air Washer and Dehumidifiers

For purifying, cooling, humidifying and dehumidifying air in all classes of buildings in various manufacturing processes and for cooling generators, motors and transformers. Thoroughly cleanses the air of foreign materials and permits the control of air temperatures and humidities. 5700 to 161,000 cu. ft. per minute. *Bulletin 3523.*

Sirocco Unit Heater

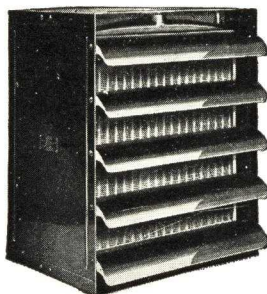
High efficiency, light weight heating element, compactness, dependability, even distribution of heat, economy of installation and operation, accessibility of parts, ease of control. For a given size and tip speed the Sirocco Unit Heater delivers more heated air than any other unit of which we know. Made in 28 sizes and capacities to fit every requirement. Particularly fitted for heating large enclosures with high ceilings. Complete with direct attached motor for all usual electrical currents. *Bulletin 8818.*



Sirocco Unit Heater

Venturafin Unit Heaters

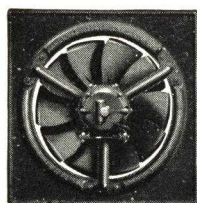
For use in modern industrial buildings, stores, garages, etc., and designed to keep heat in working areas where it is needed. Venturafin Units are adaptable to high, medium or low pressure steam applications—for floor, wall or ceiling installation. Venturafin Units are easy to install—economical to operate and maintain. Complete with direct attached motor for all usual electrical currents. *Bulletin A-3718.*



Venturafin Unit Heater

Ventura Disc Fans

For ventilating rooms and for exhausting fumes from pickling vats; paint-fog from paint spray booths, etc.; require very little space; economical; light, strong and efficient. 600 to 18,000 cu. ft. of air per minute. Complete with direct attached motor for all usual electrical currents. *Bulletin A-7229.*



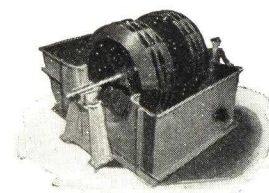
Ventura Disc Ventilating Fan

Mechanical Draft Equipment

American Blower manufactures all types of mechanical draft apparatus, including high speed forced draft blowers for direct connection to motor or turbines, slow speed blowers for belt, reduction gear or engine drive, Multiblade fans for induced draft and forced draft, special high pressure fans for the modern high rating boilers.

All of this material is of extra heavy construction for power plant use, and is designed for the highest operating efficiencies as worked out through our extensive research facilities.

Bulletin 24—Series 3.



Large High Speed Forced Draft Blower

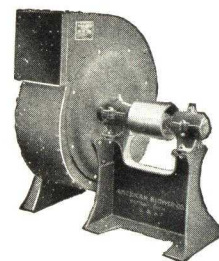
Upper half of housing removed

Exhaust Fans and Pressure Blowers

These are manufactured in a number of different types to meet varying requirements.

Exhaust fans remove refuse and waste of all kinds and are also used for conveying.

Blowers supply air blast to forges, furnaces and cupolas; sintering, smelting and pulverized coal machines; also used for blowing scale from dies, or other duties requiring air at pressures up to 1½ lbs. Types for high and low speeds with capacities up to 75,000 cu. ft. per minute. *Bulletin 4406.*



Steel Plate Exhaust Fan, Type "E"

One of the several types for various applications

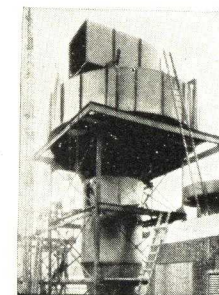
Sirocco Dust Collector

A most practical and highly efficient means of collecting a wide variety of fine dusts. Particularly applicable to the collection of cinders, fly-ash and coal dust.

Of rugged design and construction, each unit is gas-tight throughout.

Extensive laboratory facilities are maintained for testing purposes.

Bulletin 1724.

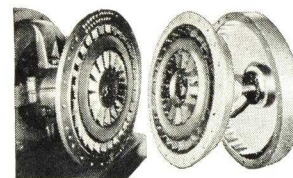


Sirocco Dust Collector

Hydraulic Coupling

A simple, efficient means of driving a machine at an infinite number of speeds from a constant driver. Particularly adaptable to machines where power varies as to the cube of the speed such as fans, pumps, etc. Permits use of simple a-c. squirrel cage motors for pump or fan drive. Manufactured by the Hydraulic Coupling Corporation and sold by AMERICAN BLOWER CORPORATION.

Bulletin 4425.



Hydraulic Coupling

Catalogues and Bulletins

Catalogues and bulletins supplied upon request.

AUTOVENT FAN & BLOWER CO.

1819 North Kostner Avenue, CHICAGO, ILL.

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Products

AUTOVENT EXHAUST FANS, LOUVRES, FURNACE FANS, UNIT HEATERS, CABINET and PORTABLE VENTILATORS, UNIBLADE PULLEY and



MOTOR DRIVEN BLOWERS, HEATING, DRYING and VENTILATING EQUIPMENT.
Also Air Conditioning Apparatus.

Autovent Exhaust Fans and Non-Overloading Fans

Designed for exhausting air from factories, chemical plants, mills, foundries, offices, etc.

A feature of the design is the method of cooling the motor. In ordinary exhaust fans this is accomplished by allowing the air to pass through the motor. This results in rapid deterioration of the motor due to the gases, acids, steam, grease or grit carried in the air. In the Autovent fan, the motor is cooled by our patented cooling system.



All bearing surfaces are exceptionally large and are well lubricated.

Autovent exhaust fans consume comparatively little power, operate with unusual quietness, are easily installed, and will run indefinitely at full load under the most trying conditions. Fans

can be equipped with safety guards.

Write for Catalogue No. 32.

AUTOVENT EXHAUST FANS

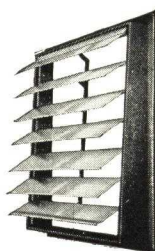
Direct Current				Alternating Current							
Size and type	Cu. ft. air per min.	Watts input per hour	Rev. per min.	Single phase				Multiphase			
				Size and type	Cu. ft. air per min. at max. r.p.m.	Watts input per hour	Max. rev. per min.	Size and type	Cu. ft. air per min. at max. r.p.m.	Watts input per hour	Max. rev. per min.
12WN	700	80	1100	*12SPL	500	85	820	16PR	1425	110	1150
12WR	950	100	1600	12SPN	700	95	1100	18PR	2300	175	1150
16WR	1425	110	1150	12CR	1000	105	1700	20PN	2300	225	850
18WN	2100	150	1050	*16QN	1020	100	820	20PR	3200	260	1150
18WR	2300	175	1150	*16QE	1425	110	1150	24PN	3400	235	690
20WR	3200	255	1150	16CR	1400	105	1125	24PR	4150	290	850
24WN	4000	285	830	*18QN	1750	160	820	30PN	6000	325	575
24WR	4350	330	900	*18QR	2300	175	1150	30PR	7200	430	690
30WN	7200	420	690	18CR	2250	170	1125	36PR	9700	600	575
30WR	8600	525	825	20CN	2300	240	850	42PR	12500	830	495
36WN	10200	610	600	20CR	3000	240	1125	48PR	18500	1420	425
36WR	12300	780	725	24CR	4150	290	850	54PR	23200	1750	425
42WR	12650	800	500	30CR	7200	425	690	60PR	28500	2140	380
48WR	17100	1315	450	36CR	9700	580	670	72PR	40000	2700	285
54WR	22350	1775	410	42CR	12400	825	475				
60WR	28200	2250	375								
72WR	38500	2600	275								

Regulators can be furnished with all sizes of fans equipped with direct current motors, also alternating current, single phase and multiphase motors.

These regulators will provide variation in speed below maximum.

Autovent "Acid-Moisture-Proof" Fans

Motors are of the fully enclosed type, the end hoods being provided with ground joints, thereby preventing motor from becoming contaminated by foreign substances, such as grit, acid fumes or moisture. Motors are of heavy duty type equipped with wool-packed bearings and are built to withstand the most severe conditions.



Autovent Automatic Louvres

Autovent Louvres are designed to prevent back draught, and provide weather protection to the fan opening.

The vanes are of heavy gauge sheet aluminum, and are connected together serially,

so they all open simultaneously, and are held open by the fan.

Sufficient pitch is given the louvre frame to cause the vanes to drop into a closed position, slightly overlapping each other, insuring ample protection against the elements when the fan is not in operation.

Either round or rectangular louvres can be furnished in sizes corresponding to exhaust fan sizes. Louvres equipped with vanes of copper or other acid resisting metals are furnished special on application.

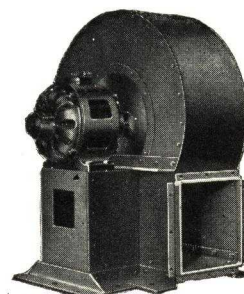
Write for Catalogue No. 32.

Uniblade Blowers, Motor and Pulley Driven

Designed for supplying and exhausting air in factories, machine shops, dye rooms, chemical and textile plants, rubber and paper mills, cafeterias, offices, etc.

The motor driven type is furnished with either direct current, singlephase or multiphase alternating-current motors. Speed regulators are furnished with all direct-current types. Alternating-current variable speed units special on application.

The pulley driven types are designed to handle large volumes of air at comparatively slow speeds. These blowers are given a true running balance at the factory, and are exceptionally quiet in operation. Additional data and prices on request.



Uniblade Blower



Small Volume Blower

Autovent Super Type Unit Heaters

Adaptable to industrial, garage and warehouse heating, where unusually large areas must be rapidly and thoroughly heated. A wide range of sizes in both the suspended and floor type is available.

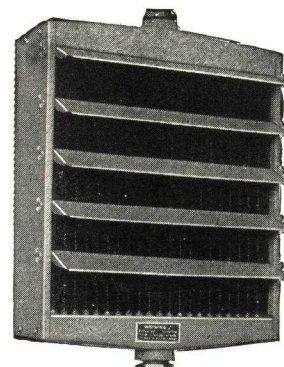
Lightness in weight and compactness facilitate locating directly above or adjacent to the area to be heated, thus conserving floor space.

An air chamber is provided between the fan and heating element, providing ample space for the air to spread out before passing through the coil.

Heating elements are of copper sheets, attached to seamless copper tubes. Installation and piping are extremely simple.

Units may be controlled manually or automatically.

Write for literature containing additional data.



Autovent Unit Heater

Catalogue

Copy of our complete Catalogue 110A, containing valuable ventilating data, forwarded on request.

CARLING TURBINE BLOWER CO.

WORCESTER, MASS.

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Products

CARLING TURBO BLOWERS.
MOTOR DRIVEN UNDER-GRATE BLOWERS.
CARLING STOKER FANS.
TURBINE PRESSURE FANS.
GAS PRODUCER BLOWERS.
TURBINE VOLUME FANS.
MOTOR DRIVEN VOLUME FANS.
CARLING STEAM TURBINES, and patented Steam Turbine Specialties.

GENERATOR SETS.

Also Carling Turbines with Reduction Gears.

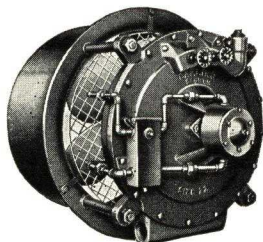
Carling Turbo Blowers

Carling Steam Turbine Blowers are made in 10 sizes with capacities ranging up to 30,000 cu. ft. per minute at pressures up to 8-in. static.

The Carling Turbo Blower is equipped with a patented safety flange which prevents explosion of the turbine through runaway should the fan wheel become detached from the main shaft. This feature is covered by Patent No. 1,307,111.

This is an ideal forced draft unit for mechanically stoked and hand fired boilers up to 1000 hp. It is quiet in operation and can be installed quickly and cheaply.

Automatic gravity feed lubrication.



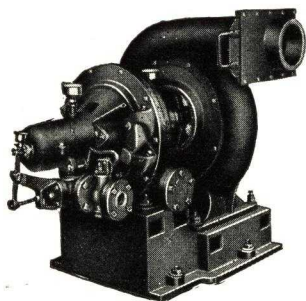
Turbo Blower

Turbine Pressure Fans

Carling Turbine Pressure Fans are made in 12 sizes with a wide capacity range at high static pressures. They are designed for gas producers and oil furnaces, for conveyors for sawdust and other light materials, and for industrial drying purposes.

They are also made for use as exhausters for gases, etc.

They are furnished either with or without a blast gate, with any angle of discharge and either right or left hand as specified.



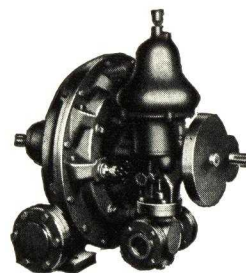
Pressure Fan



Turbines with Flyball Varying Speed Governor

Adjustable varying speed can easily be obtained while turbine is in operation by merely turning a small hand wheel which is in plain view on the outside of the governor.

The speed can be varied 50% from high to low or from low to high.



Turbine with Flyball Governor

Governor is fully enclosed in dust and air-tight casing with gears running in oil.

An ideal turbine where wide speed range is required. Made in six frame sizes.

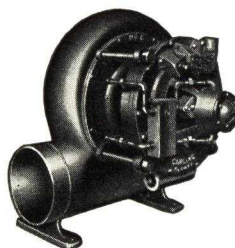
Turbine Volume Fan

Designed for delivering a large volume of air at low pressures up to 10-in. static. It is supplied as a blower with two air inlets or as an exhauster with one inlet for pipe connections. The fan may be placed in any position.

No special foundation is required as there is no vibration because of special care in balancing. It is built as a unit, the fan wheel being mounted direct on the end of the turbine shaft, thus eliminating the necessity of a coupling. The turbine shaft is mounted on ball bearings, reducing friction to a minimum.

Built for continuous service it requires no attention other than lubrication. All parts are of heavy and substantial design with a wide margin of safety. Ideal unit for hollow blast grates and for many other purposes.

Furnished in 15 sizes with any angle of discharge.

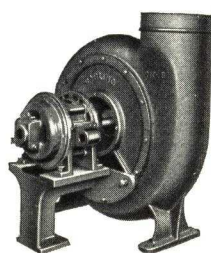


Turbine Volume Fan

Motor Driven Volume Fans

Carling Motor Driven Volume Fans of the centrifugal type are made in 20 sizes from 50 to 20,000-cu. ft. per minute capacity. They are furnished with any type motor and with any angle of discharge either right or left hand.

They are designed especially to furnish forced draft for boilers, but can also be built for exhausters, for use with conveyor systems, and for handling fumes, etc.



Motor Driven Volume Fan

Carling Steam Turbines Type "A"

Carling Steam Turbines are covered by seven distinct patents which embody the latest engineering developments and design.

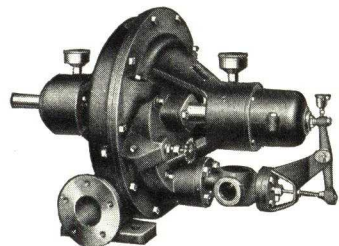
Turbine Casing and Cover—Made of solid semi-steel castings of heavy construction to withstand high back pressure and superheated steam. The steam inlet and passages are especially designed for easy flow and tested at 300-lb. hydraulic pressure per square inch. The turbine cover fits into the turbine casing with a ground metal joint, making it absolutely steamtight.

Rotor—Is of the two-velocity stage, impulse type, cast of solid phosphor bronze, with ten buckets per inch of diameter.

Rotor Blading—Made of monel metal, is cast into the bronze casting by our patented process which makes it impossible for the blading to work loose or come out.

The blading is further protected by a shroud ring riveted around the entire periphery, top and bottom.

Main Governor—Is of the centrifugal type, mounted on the shaft which operates a balanced steam admission valve. It controls the speed of the turbine within close limits of variation.



Steam Turbine Type "A"

Emergency Governor—Is provided to automatically shut off the steam if the main governor should fail to operate. This governor is adjusted to function at 15% above the set speed of the main governor.

Safety Flange—Is a patented feature of all Carling Turbines. It prevents bursting of the rotor through runaway in case of accident to the governor mechanism.

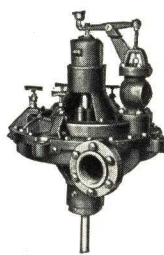
Nozzles—Made from tobin bronze or monel metal and are so inserted that they cannot work loose.

Packing—Is of the patented Q.P. type, consisting of a series of conical fibrous rings. It automatically seals itself, is self-lubricating, requires no adjustment after it is once put in and will withstand 30 lb. back pressure without leaking.

Ball Bearings—Are of the heavy-duty, double-row, precision type, held in removable wearing sleeves. Both bearings can be replaced in less than one hour.

Lubrication—Can be by either light grease or oil, depending on the customer's preference which should be specified when ordering.

Direction of Rotation—Can be either clockwise or counter-clockwise as specified.



Vertical Turbine Type "V"

Vertical Steam Turbines

Made in five frame sizes and are furnished complete with bosses and supporting studs.

Refer to Type "A" Carling Steam Turbine for general specifications. With or without governor.

Horizontal Split Turbines Type "C"

Efficient, custom built turbine of the multi-stage type designed after long experience in the manufacture of steam turbines. Made in four frame sizes.

Brief Specifications—

Horizontally split on the center line.

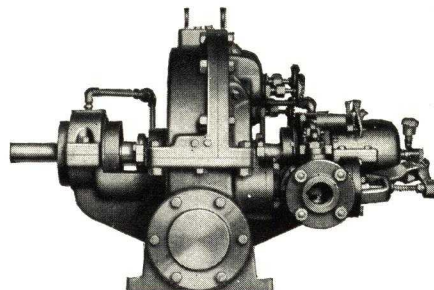
Automatic gravity feed lubrication.

Heavy duty double row ball bearings.

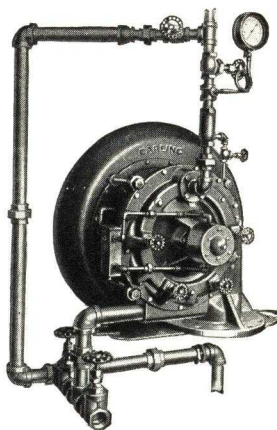
Turbine is designed so that it can be taken apart and inspected without disturbing any of the steam connections.

Chrome nickel steel shaft.

Monel metal or chrome nickel steel turbine blading.



Horizontal Split Casing Type "C"



Gas Producer Blower

Gas Producer Blower

Will greatly increase the capacity of any type of gas producer and substantially improve the quality of gas output.

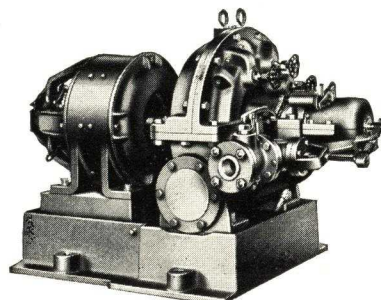
Furnished complete with piping, blast gate and valves, ready to mount to any type of gas producer.

250 gas producers now equipped.

Generator Sets

Carling Generator Sets are made in the smaller sizes from 1 to 75 kw. capacity in either alternating or direct current at speeds of 1200, 1800 or 3600 r.p.m.

Direct connected by flexible coupling and mounted on a common bed plate.



Generator Set

COPPUS ENGINEERING CORPORATION

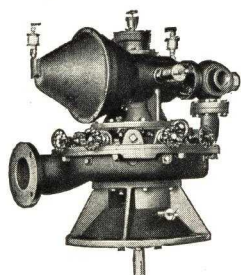
Manufacturers of Blowers, Steam Turbines and Air Filters

346 Park Avenue, WORCESTER, MASS.

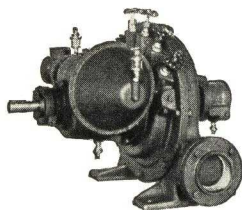
BRANCHES OR REPRESENTATIVES IN ALL PRINCIPAL CITIES OF THE WORLD

Steam Turbines

Ideal prime movers for pumps, blowers, mixers, and many other process machines requiring dependable, compact, economical drive. Scientifically designed according to accepted principles of turbine practice. Turbine wheels are of two-row velocity stage impulse type with reversing sector. Buckets are of non-erosive, non-corrosive drawn chrome steel alloy. Steam nozzles are accurately finished and controlled by individual valves. Oversize self-aligning ball bearings used. Exceptionally large oil reservoirs insure adequate lubrication. Can be equipped with reliable low-speed, fully enclosed governor, designed especially for these turbines.



Vertical Type



Horizontal Type

Unique safety trips also available. Combine good steam economy with outstanding reliability of operation. Price comparable to that of electric motor of same rating. Built in horizontal and vertical types, in four frame sizes from 1 to 60 hp. Also available in fractional horsepowers for special applications at low cost. Exhaust steam is free from oil and can be used for heating or process work.

Turbines also built for air or gas drive.

Ask for Bulletin 135-6.

Air Filters

Annis Air Filters are used in general ventilation, air conditioning, drying operations, and in ventilating electrical machinery; also on air intake of compressors or internal combustion engines.

Filters are dry type of simple strong unit construction. 100 per cent efficient by test. Permanent wool felt filter element "slips on like a glove" over welded wire spacer frame, forming unit, clamped to base by spacer grid.



Filter Element
Partly on Spacer
Frame, with
Spreader Grid

The filter elements are not affected by dampness or moisture, a very valuable quality when used entirely on fresh air intakes. Elements impose minimum constant restriction to air passage and may be cleaned without removal, by vacuum cleaner or air lance.

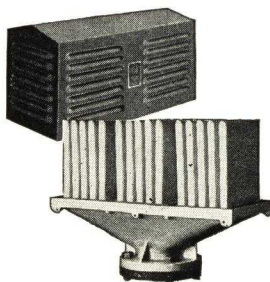
Weatherproof housing for outdoor erection can be supplied as part of assembly.

Annis Air Filters are 100 per cent efficient and

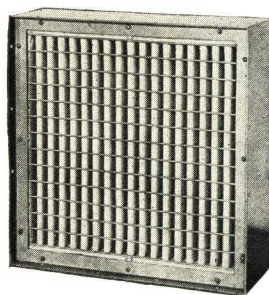
can be underrated (used for lower capacities) any amount without sacrificing the cleaning efficiency.

Made for any capacity in stationary and automatic types.

Send for Bulletins F-310 and F320.



Compressor Filter



Stationary Type Unit Filter

Forced Draft Blowers

Type "C" and "CM," respectively steam turbine and electric motor driven, in capacities up to 20,000 c.f.m. for stoker or hand fired boilers. Fan wheels designed for specific static pressures up to 5 in. Turbines are of one or two row velocity stage impulse type.

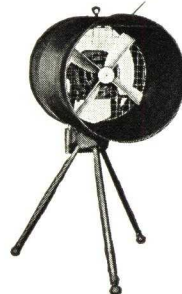
Provide increased boiler capacity, maintain even steam pressure independent of natural draft and permit burning low priced fuels and mill wastes.

Send for Bulletins 145 and 148.

Heat Killers

Are man-cooling fans and blowers of either Vano or Aeroplane type, light weight and portable for cooling and ventilating boilers, tanks, furnaces, and in steel mills, foundries, gas plants and all industries where men are exposed to intense heat. Vano types are swivel mounted on tripod and deliver from 950 to 3000 c.f.m. at high velocity. Aeroplane types deliver 10,500 to 15,600 c.f.m. at low velocity. Both types prevent re-circulation and deliver a large volume of secondary air.

Aeroplane Type



Cable Manhole Ventilators

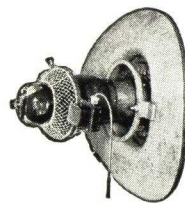
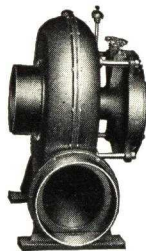


For ventilating cable vaults, tunnels, pipe galleries, coal pockets, shipholds, etc. May be fitted with canvas air pipe. Light weight and easily portable. Tripod mounted unit uses Vano type blower. Furnished with universal electric motor for operation from lighting system or truck storage battery; also gasoline engine driven.

Capacities 950 to 1500 c.f.m.
Bulletins 163 and 166.

Manhole Blower Exhauster

Vano type Nos. 150 and 175 are built for ready attachment to manhole and carry ¼ hp. and ½ hp. universal motors, for direct and alternating current. Weight only 68 and 88 lbs. Can be hooked up easily and locked in place by one person. Complete unit includes manhead and yoke, starting switch, cord and plug.



Centrifugal Turbo Blowers

Type M, steam turbine driven, of single unit design, as all Coppus specialties, serves for static pressures up to about 15 in. with a capacity range of from 400 to 10,000 c.f.m. Used for gas producers and other applications where exhaust steam can be used to good advantage and flexible operation is desired.

Send for Bulletin 155.

Combustion Control

A mechanical draft blower for domestic heating plants for delivering air to fire bed under slight pressure. Overcomes bad draft—permits use of low-priced fuels—automatic action.
Bulletin 205.

B. F. STURTEVANT COMPANY

Heating, Ventilating and Air Conditioning Apparatus and
Power Plant Equipment

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400 North Michigan Avenue
CHICAGO, ILL.

681 Market Street
SAN FRANCISCO, CAL.

Branch Sales Engineering Offices in All Principal Cities

Products

FANS for Heating, Ventilating, and Air Conditioning systems—Forced and Induced Draft applications, Collecting and Conveying, General Utility purposes.

UNITS for Heating, Ventilating, Humidifying, Cooling, Air Conditioning.

Also Drying Systems for Textiles, Lumber, Chemicals; Heavy Duty Portable and Stationary Vacuum Cleaners for Public Buildings and Industrials.

Sturtevant
(REG. U.S. PAT. OFF.)



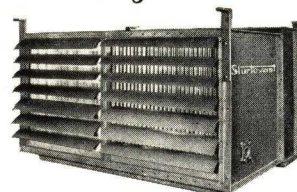
Air Conditioning

The Suspended Type Air Conditioning Unit is only one of many units, carrying the Sturtevant name, which are designed for this type

of application. This unit operates for year around service. It is designed for industrial application where winter heating and humidifying, and summer cooling and dehumidifying are required. Or it can be arranged for individual summer or winter operation. In either case, the air leaving the unit is exceptionally clean as it passes through a series of filters.

A decided advantage found in this unit when used for cooling is that it does not frost, and the defrosting cycle so necessary with the commonly conceived unit cooler is not necessary.

Sturtevant also offers a complete service in central system air conditioning work through the Sturtevant Cooling & Air Conditioning Corporation, a division of the parent company.

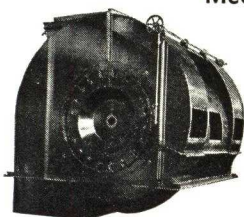


Suspended Type Air Conditioning Unit

Mechanical Draft Fans

Sturtevant Turbovane Forced and Induced Draft Fans have many advantages over older types of mechanical draft fans which have placed them among the foremost in the power fields. Installations of these fans are to be found in most of the large industrial and utilities power plants.

An added feature of the Turbovane Induced Draft Fan is the automatic vane control. Movable vanes in the fan inlet, governed by a sensitive automatic regulator, accurately control the output of the fan in accordance with the demands of the boiler. Through the application of automatic vane control, the use of rugged constant speed motors is made possible with range of control greater than can be obtained with slip-ring motors, and results in a great saving in power.



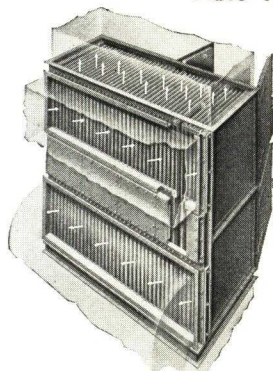
Turbovane Induced Draft Fan

tive automatic regulator, accurately control the output of the fan in accordance with the demands of the boiler. Through the application of automatic vane control, the use of rugged constant speed motors is made possible with range of control greater than can be obtained with slip-ring motors, and results in a great saving in power.

Plate Type Air Preheaters

Realizing that sooner or later the cold end of air economizers is subject to corrosion, we have designed an air economizer with chambers that can be removed and reversed, thus preventing failure of one end of the machine before the rest wears out. Special copper bearing steel plates are used to resist corrosion.

Four bolts hold the chambers to the front of the machine. A door in the rear allows the machine to be readily accessible for cleaning or removal of chambers. Proper cleaning while in service is accomplished through steam lance opening in the front and rear doors.

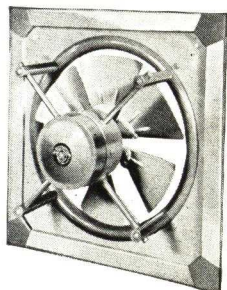


Air Preheater

Propeller Fans

The Sturtevant Propeller Fan has an attractive appearance and combines the advantages of high capacity and light weight. The design of the wheel produces a practically uniform air velocity over its entire area, making it exceptionally effective. The ball bearing motor is suitable for either horizontal or vertical operation and is totally enclosed for permanent protection against dust and grease.

The motor support is welded to the ring, which is curved both for strength and to provide a streamlined path for the air. The fan may be purchased either with or without the mounting panel. Sizes are 12, 16, 20 and 25-in. wheel diameter. Larger sizes are made in another design.



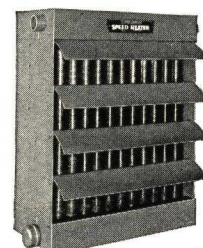
Propeller Fan

Unit Heaters

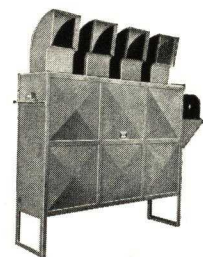
The Sturtevant Speed Heater has become an extremely popular unit for heating industrial plants, garages, shops and similar areas. It is rugged, yet attractive. The heating element is designed to withstand all strains caused by uneven expansion and is guaranteed for any steam pressure up to 150 lbs. It comes completely equipped with horizontal louvers, hangers, multiple speed motor and switch.

Speed Heaters are available in ten sizes, ranging in capacity from 40,000 to 300,000 b.t.u. per hour. All units are standard and are stocked in all the popular motor characteristics, allowing shipment within 48 hours.

The floor type heater is designed for heavy duty work and stands on the floor. Adjustable outlets provide a flexible method of distributing the heated air. The heating element in this unit will also handle any steam pressure up to 150 lbs.



Industrial Type Speed Heater

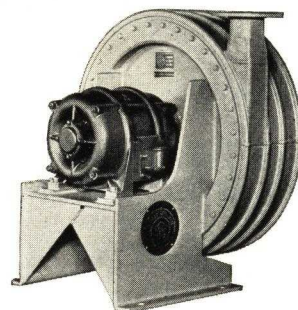


Floor Type Heater

Centrifugal Compressors

The Sturtevant Design 9 Centrifugal Compressor is exceptionally well suited for industrial furnace, conveying and pneumatic tube work. It will deliver a comparatively wide range in air volumes at an almost constant pressure.

Quietness of operation and high efficiency are its outstanding advantages. It is also an economical unit as it only uses the amount of power in proportion to the volume handled. The only attention required is lubrication of the motor two or three times a year. Skilled operators are not necessary and maintenance is reduced to a minimum.



Design 9 Centrifugal Compressor

CLARAGE FAN COMPANY

MAIN OFFICE AND PLANT
KALAMAZOO, MICHIGAN

SALES ENGINEERING OFFICES IN PRINCIPAL CITIES (Consult Telephone Directory)

Products

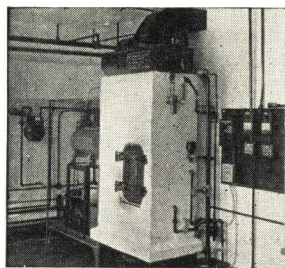
UNIT AIR CONDITIONERS, UNITHERM UNIT HEATERS, UNITHERM UNIT COOLERS, MULTIBLADE FANS, AIR WASHERS, MECHANICAL DRAFT EQUIPMENT, EXHAUST FANS, PRESSURE BLOWERS, VOLUME BLOWERS.

Also Vertical Steam Engines, Blast Gates, Louver Dampers.

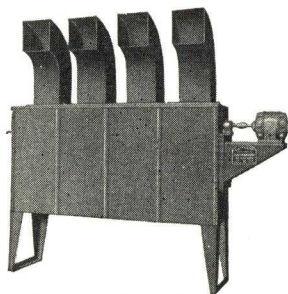
Engineering Service

Catalogues and engineering data covering every Clarage product will be promptly mailed upon request. Write for a Clarage recommendation to meet your particular requirements—no obligation.

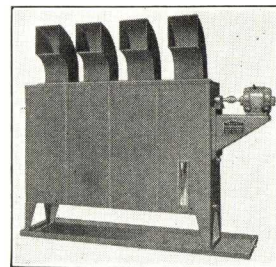
AIR CONDITIONERS, UNIT HEATERS AND UNIT COOLERS



Unit Air Conditioner



Unitherm Unit Heater



Unitherm Unit Cooler

Unit Air Conditioners

Designed to cool, humidify or dehumidify as desired. Successfully used in process industries, in paper mills, textile plants, tobacco factories, printing plants, etc. As compared with older types of central station equipment, these units offer greater flexibility, closer and easier control, eliminate costly duct system, and produce equal or better results at a decided saving. Built in a wide range of sizes to meet individual requirements.

Unitherm Unit Heaters

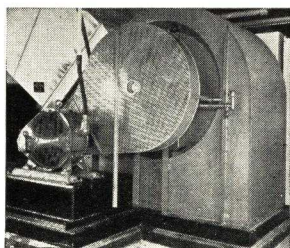
Suitable for all types of industrial heating, for garage installations, etc. Equipped with positive centrifugal fans having self-limiting horsepower characteristic, and with heating coils

for pressures up to 200 pounds. All parts accessible, both fan assembly and coil easily removed. Capacities from 217,000 to 866,000 B.t.u., either for ceiling or floor mounting. Quiet in operation.

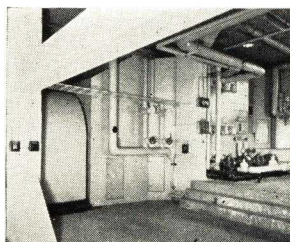
Unitherm Unit Coolers

Recommended for product, space and comfort cooling, or for any type of refrigeration. Brine or a direct expansion refrigerant used as cooling medium, producing practically any desired temperature. Ideal for food, fur and other storage plants, industrial process work, etc. Units quickly installed, saving labor, materials and plant alterations, eliminating costly bunkers and wall coils. One unit will efficiently cool one room, while battery of units will handle larger requirements.

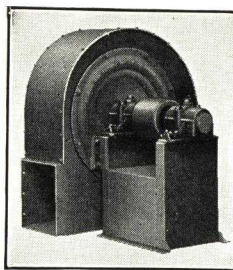
AIR WASHERS, FANS AND BLOWERS



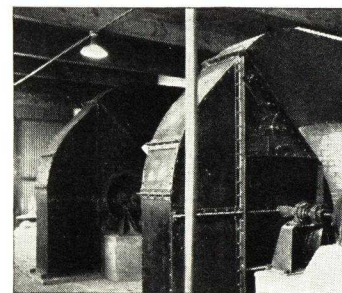
Multiblade Fan



Air Washer



Exhaust Fan



Type FD Blowers

Multiblade Fans

Designed for heating, ventilating, cooling and air conditioning in factories, schools, churches, theatres, office buildings, tunnels, etc. Silent in operation. Built in Types HV and HSV. Type HV Fans particularly adapted to flat belt drive. Type HSV Fans ideal for direct motor or short center, V-belt drive. HSV Fans have full self-limiting horsepower characteristic. Built single and double width with capacities from 50 to 500,000 c.f.m.

Air Washers

For air purifying, cooling, etc., in industrial plants and public buildings. Improved spray nozzles produce unbroken mist screen at lower pump pressures, saving considerably in pump horsepower. Large water passages in nozzles prevent clogging. Entire weight of headers and eliminators carried on supports in bottom of tank—no strain on sides of washer. Built in various types and sizes to meet all requirements.

Exhaust Fans

Built in various types and sizes to meet every exhaust and pneumatic conveying requirement. Furnished with sealed dust-proof, oil-tight babbitted bearings or with ball bearings as desired. Smaller sizes in all types reversible for direction of discharge and rotation. Extra heavy construction insures trouble-free operation. Furnished for direct motor or belt drive.

Type FD High Speed Blower

For forced draft giving high efficiency over wide operating range and with self-limiting horsepower characteristic. Standard equipment includes grease type ball bearings and electrically welded wheels. Designed for direct drive from electric motors or steam turbines. Sizes to meet all conditions.

This company also builds a complete line of induced draft fans of extremely heavy construction, bearings water cooled. Offered single or double inlet, standard or double width.

PARKS-CRAMER COMPANY

980 Main Street, FITCHBURG, MASS.

HUMIDIFYING DEVICES

Atomizer, Fanspray
Spray, Centrifugal
and Central Station
for Every Purpose
Industrial, Office
Commercial and Home

AUTOMATIC REGULATORS

Psychrostat for
Heat, Humidity
and Air Change
Hygrostat, Operates
Pneumatic, Magnetic
or Motor Valves
Wet Bulb Regulators

Design, Manufacture and Installation of AIR CONDITIONING EQUIPMENT

HEATING
HUMIDIFYING
VENTILATING
AIR FILTERING

Park Spray
Certified Climate
REG. U.S. PAT. OFF.

COOLING
DE-HUMIDIFYING
REFRIGERATION
AIR WASHING

AUTOMATIC REGULATION

DIAPHRAGM VALVES
AUTOMATIC AIRCHANGER

JACKETED PIPE, VALVES
AND FITTINGS

INDUSTRIAL HEATING
By Oil Circulation with
the Merrill Process

CLEANING DEVICES
Traveling Cleaner
for Spinning Frames
Pneumatic Cleaning
Devices-Blowguns,
Quick-Hitch Couplings
Air Hose and Fittings

INDUSTRIAL PIPING
Pipe Fabrication
Pipe Bends
Engineering for
Fuel Economy

Home, Office and Non-Industrial Air Conditioning

The Mistyfier safeguards health and increases comfort. Reduces dust. Preserves furniture, woodwork, books, paintings, draperies, rugs, plaster, flowers and plants.

It evens the effective temperature; makes 70° F. seem comfortable. It is quiet and automatic; no expensive plumbing. Inexpensive to operate. Capacity instantly adjustable for larger or smaller spaces.

Unit Air Conditioner

Principle similar to Mistyfier but for larger spaces, or may be made a part of a basement installation.

In the home or office, it isn't the heat that is injurious—it's the dryness. Where plants dry up, colds do not.

Industrial Air Conditioning

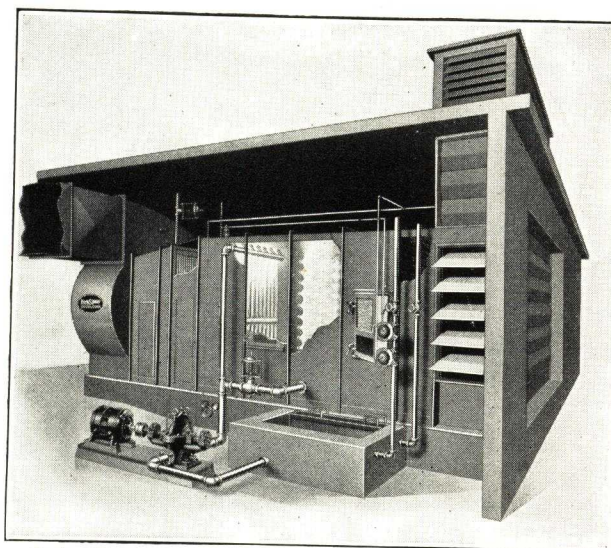
Helps in many industries, notably, Textiles (Cotton, Wool, Worsted, Silk, Rayon, Jute); Printing and Lithographing; Cigar, Cigarette and Tobacco; Clothing; Paper and Envelope; Leather and Shoes; Wood Products, Cereals, Storage of Perishables; Ceramics; Celluloid; Glassine Paper; Starch and Dextrine; Cement. Installations similar in design are effective in Hospitals, Art Galleries, Auditoriums and Restaurants.

High Duty Humidifier

Water under pressure generates spray. Excess water returns to filter tank and is recirculated. Evaporation per unit high (two sizes of heads with two sizes of nozzles for each for varying conditions), and circulation increased by individual motor-driven fan. Spray thoroughly diffused and distributed over wide area.

Centrifugal Humidifier

Not illustrated. Water without pressure. Produces fine spray.



Parks Plenum Central Station which with Automatic Regulation, may include Heating, Cooling, Humidifying, De-humidifying, Ventilation, Refrigeration, Air Filtering and Air Washing in one Central Apparatus

High Temperature Industrial Heating (at low pressure) by Merrill Process Oil Circulation

A special mineral oil, circulated at high velocity by positive rotary pump, passes through Parko heater to supply mains and on to apparatus, such as jacketed kettles, tanks, pipe coils. Continuous circulation is positive. Static pressure usually not over 15 pounds.

Temperatures as high as 600° F. (316° C.) may be obtained without physical or chemical change in oil. An ideal and inexpensive method where materials have to be raised from 300° F. to 550° F. allowing ample temperature difference for rapid heat transfer.

Jacketed Pipe and Fittings

For conveying hot liquids which at ordinary temperatures are solid or viscous.

Plug-cocks, crosses, tees and expansion joints are available in several sizes.

Turbo Humidifier

An "atomizer" type. Uses compressed air to produce fine quality of spray. Water not under pressure. No moving parts, easy to keep clean. Best adapted to low posted rooms—or where for distribution, many units are desirable.

Central Station Equipment

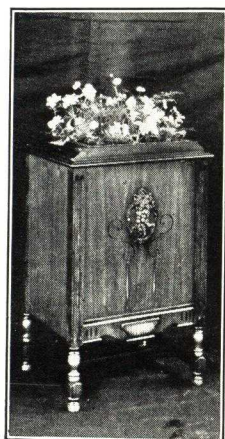
A centrally located apparatus for supplying maximum moisture needed with positive pre-determined air change. Usually includes indirect radiation for heating—may include refrigeration and cooling. All air is washed. Automatic Regulation is essential. While initial and operating costs are high, this absolute and centralized control of certified climate is often very desirable.

Automatic Regulation

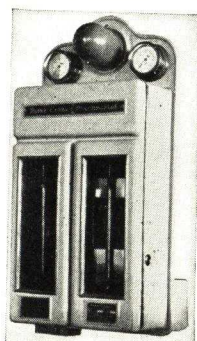
The Psychrostat for accuracy, durability, sensitivity. Hygrostat (not illustrated) where requirements are not so exacting.

An Air Conditioning System Is No Better Than Its Regulation

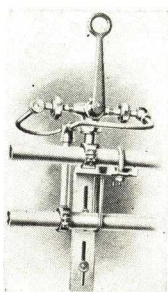
The Psychrostat is the only Automatic Air Conditioning Regulator, using the Principle of the Sling Psychrometer. U. S. Government uses Sling Psychrometer in all Weather Bureau Stations.



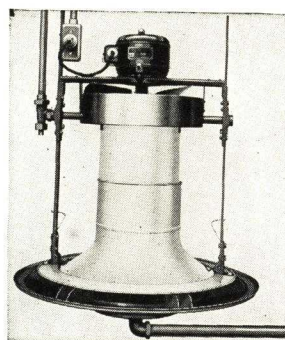
Mistyfier



Psychrostat



Turbo Humidifier



High Duty Humidifier



Unit Air Conditioner

INDEPENDENT AIR FILTER CO.

Air Cleaning Equipment for All General Ventilation and Industrial Process Requirements

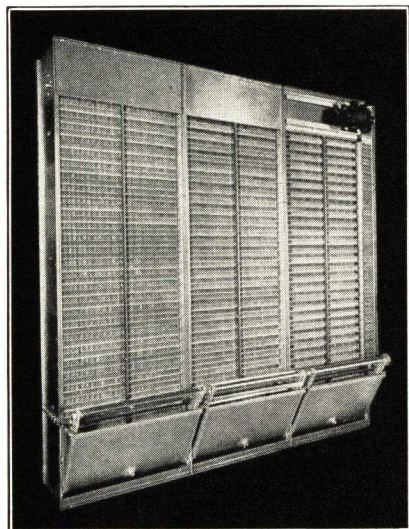
215 West Ohio Street, CHICAGO, ILL.

REPRESENTATIVES IN PRINCIPAL CITIES OF UNITED STATES AND CANADA

"Double-Duty" Model "L" Air Filter

For large capacity installations. Made only with motor drive and automatic control.

This filter is used for general ventilation in large buildings and for a wide variety of industrial applications—in fact, wherever conditions indicate the need for a strictly automatic, high efficiency filtering machine.



Three Section Model "L" Group

Capacity 36000 c.f.m. Overall dimensions 9 ft. wide by 10 ft. 9 in. high

to always drain downward and against the direction of air travel. Entrainment of oil is thereby positively prevented.

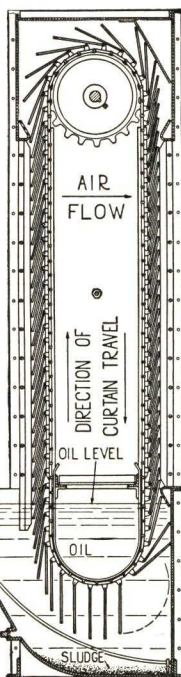
Standardized Sectional Construction—Easy, quick installation. Sturdy sections shipped completely assembled ready for direct connection to sheet metal ducts. Sections easily added to increase capacity.

A sturdy, all steel filter curtain, perfectly flexible and evenly balanced. Friction reduced to minimum by roller shaft bearings.

Air given three acute deflections on each passage through curtain—six deflections in all.

Each periodic movement of the curtain brings out the portion which has been immersed in the oil bath; thus exposing a thoroughly clean section of curtain, and immersing a corresponding portion of dirty curtain to be cleaned.

Sludge is removed at intervals of three to six months, depending on dust content of air. Only bulk of sludge need be removed. Oil consumption negligible—never changed; merely replenished.



Double-pass Efficiency—Two complete filtering actions through curtain, with air space between. The effective design of the individual baffle plates with their rasp-like surfaces, gives the highest cleaning efficiency possible by the viscous impingement method.

Constant Air Delivery—This vital factor assured by the non-clog feature of the filter plates. Initial resistance is the final resistance, never varying day in and day out, regardless of the dust content of the air.

True Impingement—Perfectly carried out in "Double-Duty" by acute deflections against the broad and roughened surfaces of the baffle plates.

Self-cleaning and Automatic—Long immersion of filter plates in the oil bath causes complete release of dust particles. Plates emerge absolutely cleaned and heavily filmed with oil.

No Oil Entrainment—The angling position of the stamped steel louvre plates causes surplus oil

Curtain drains thoroughly on up-travel, preventing any possibility of free oil remaining on plates as they pass over the top.

As curtain ascends, dust impinges on outer surfaces of filter plates; as it descends the air stream encounters the opposite surfaces of the plates—an exclusive "Double-Duty" feature.

Filter plates tilted downward against air travel cause complete drainage on both up and down movement. No oil entrainment possible, even at excessive velocities.

When filter plates are immersed, surface tension of oil film is released, allowing dust particles to settle by gravity. Slow travel of curtain allows ample time for this process.

"Double-Duty" Model "M" Air Filter

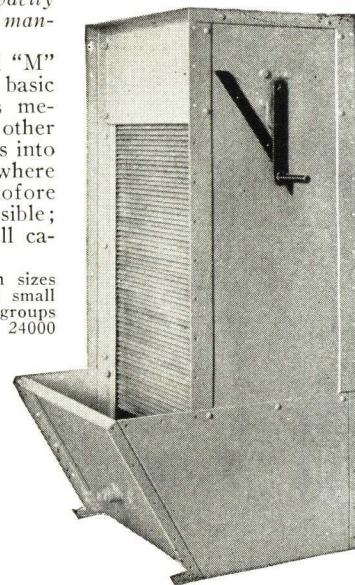
For medium and small capacity installations. Motor drive or manual operation optional.

The "Double-Duty" Model "M" Air Filter, while identical in basic principle, differs in various mechanical features from our other "Double-Duty" models. It fits into a large field of application where automatic filters have heretofore not been considered feasible; namely, installations of small capacity.

Sizes—Model "M" is made in sizes ranging from single sections as small as 1500 c.f.m. up to combination groups having total capacity as high as 24000 c.f.m. Standard type motor-driven and automatic in operation, requiring only occasional inspection and removal of sludge.

Manual Control (Optional)—In principle and design Model "M" lends itself perfectly to manual control, thereby eliminating the extra cost of motor and gear drive. Servicing is limited to a single easy pull of the lever—not often more than once a day under extreme conditions and only once or twice a week under average conditions.

We especially recommend Model "M" with manual control for air compressors, Diesel engines and a wide variety of small ventilating jobs, where its self-cleaning, constant-effect features are highly desirable.



Single Section Model "M"

Manual control can be furnished on any size unit, but is recommended only on single sections from 1000 to 4500 c.f.m. capacity. Capacity of above unit, 1500 c.f.m. Overall dimensions 2 ft. wide x 3 ft. 4 in. high

The "Kompak"

A Dry Fabric Filter with Renewable Medium

For general ventilation and industrial air cleaning.

Features

(1) **High Cleaning Efficiency**—Highest possible in any commercial air filter.
(2) **Maximum Filter Area**—Made possible by compact arrangement of spacing elements. Resultant low velocity through medium accounts for low resistance and long life of filter material.

(3) **Ease of Operation**—Filter unit instantly and easily detached. Entire operation—unloading, refilling, replacing each unit—consumes at most 3 minutes.

(4) **Cheap Renewal**—Low-priced commercial cotton medium used for replacement at less expense than reconditioning more expensive material. Our standard "Filterdown," a high-grade fluffy cotton, sells at one cent per square foot. Various other grades can be used successfully in the "Kompak" filter.

(5) **Sturdy Construction**—Extra heavy throughout. Filter units cadmium plated. No rusting or depreciation.

(6) **Simple Installation**—Frames shipped in one piece, with provision for direct attachment of sheet metal connections. Filter units have initial filling of material and are boxed individually. Special service rack with each group.

Rating—Standard rating 600 c.f.m. per unit. Velocity through filter material 22½ f.p.m. Initial resistance .15 in. water gauge. Rating can be varied to suit specific conditions. Where conditions are unusual, our engineering advice should be secured.



Full technical information and advisory engineering services freely furnished. Comprehensive laboratory facilities for solution of special problems.

OWENS-ILLINOIS GLASS COMPANY

INDUSTRIAL MATERIALS DIVISION

Manufacturers of Dustop Air Filters
TOLEDO, OHIO

ATLANTA
BALTIMORE
BOSTON
BUFFALO
CHICAGO

CINCINNATI
CLEVELAND
COLUMBUS
DALLAS
DENVER

DES MOINES
DETROIT
INDIANAPOLIS
KANSAS CITY
LOS ANGELES

LOUISVILLE
MEMPHIS
MILWAUKEE
NASHVILLE
NEW ORLEANS

NEW YORK
PHILADELPHIA
PORTLAND, ORE.
PITTSBURGH
ST. LOUIS

ST. PAUL
SALT LAKE CITY
SAN FRANCISCO
SEATTLE
TOLEDO

"Dustop"—the Glass Wool Air Filter of Highest Efficiency and Lowest Cost

The "Dustop" glass-wool air filter has created a sensation with its exceptional efficiency and astonishing low cost. Here is an air filter section 96 to 98% efficient—scientifically developed to meet the most exacting air-cleaning requirements—sold at a price so far below that of other air filters that it has found itself in immediate wide demand for all types of ventilating and air conditioning installations.

"Dustop" Superiorities

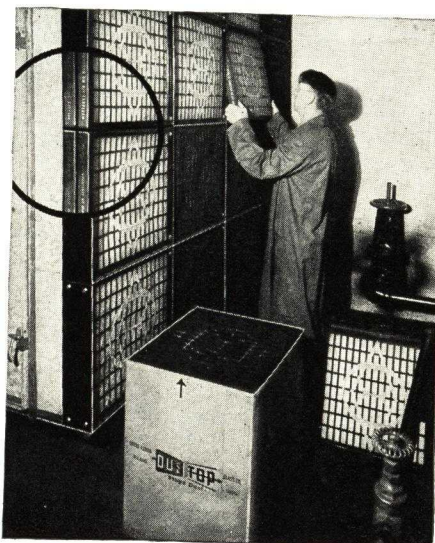
The construction of the "Dustop" filter unit holds numerous advantages found in no other filter.

The Container—The right proportions of coarse and fine glass wool coated with viscous material are machine packed in 20x20x2-in. paper container with open grid-front and grid-back. The heavy paper used as container is waterproofed. It is light in weight and makes the unit easy to handle. It fits snugly into the sectional type steel frame designed for it, and the air current holds its flexible edges firmly against a steel flange so that, unlike other types of steel encased filter units, it permits practically no leakage of unfiltered air around its edges, and is not subject to objectionable vibration noises.

The Glass Wool—This new filtering medium is the most satisfactory ever created. The spun glass fibers are packed in a "jack-straw" pattern assuring that the air will find no clear channels through the mass. The fineness and density of the filter medium increase from the intake to the exhaust side, the front, or more widely spaced fibers take their full load of coarse particles while the finer and more closely packed fibers in the back form a barrier to the small, finely divided dust particles. Practically every molecule of air at some point in its passage through the 4 ins. of glass wool must impinge itself on some viscous coated fiber. The glass wool, being non-absorbing, all of the adhesive coating remains permanently on the surface in a condition to catch the finest particles of dust, lint or soot.

Each particle caught is wetted by the viscous coating and made ready to catch another so the fibers constantly increase their adhesive surface. Yet there is no appreciable diminution of air flow until the dirt content approaches the weight of the filter itself.

Its tremendous capacity for dirt gives "Dustop" unusually long life—six to eight weeks under continuous



"Dustop" filter units are 20x20x2 in., weighing only 2 lbs. each. The standard steel frames are sectional type adaptable to any size of installation. The filter units are set up double providing a 4-in. thickness of glass-wool through which the air must pass. Illustration shows the ease with which saturated sections are removed and replaced

operation in dirty districts—and then only the filter on the intake side is discarded.

The Adhesive Material—The "Dustop" adhesive is a heavy grease-like material with a large dust-holding capacity. It is unaffected by temperatures below 220° F., so is as efficient in dust-catching at low as well as normal temperatures. The filters can be carried in stock without danger of deterioration of the adhesive, nor will the adhesive run off if the filters are installed adjacent to heating coils. Being nearly a solid, no vapors or particles of the adhesive are carried away by the air stream. All materials used in "Dustop" filters are odorless.

Double Unit Installation

Efficiency and economy are both served by the installation of two "Dustop" filters in series. The intake filter catches approximately 90% of the dirt leaving the back filter 90% clean. When the intake filter approaches saturation it is easily removed by inserting a metal blade beneath it and lifting it over the barbs that hold it in place. The back filter is then placed on the intake side, with a new filter behind it. The "Dustop" frame units can be nested for handling and are quickly and easily erected.

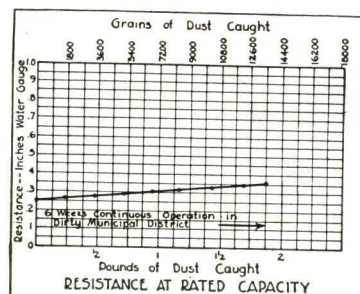
Maintenance Easy and Inexpensive

The replacement of units at intervals of several weeks is the only maintenance operation required, and, owing to the ease with which this is done and the low cost of replacement units the "Dustop" filters are much more likely to be maintained at highest efficiency than those that have to be taken out for days to be cleaned, re-oiled and re-installed.

"Dustop" filters cost so little that it is much cheaper as well as far less troublesome to maintain them and throw the saturated units on the rubbish heap than to use the filters that require cleaning.

Rating

Capacity per unit, 800 c.f.m.
Velocity—300 f.p.m.
Overall size of unit frame, 20x20x4 3/4 in.
Resistance at rated capacity, clean, .25 in. w.g.; dirty, .36-.40 in. w.g.



No. 4

SWEET'S ENGINEERING CATALOGUES

SECTION 2

POWER PLANT EQUIPMENT

AMERICAN CHIMNEY CORPORATION

147 Fourth Avenue, NEW YORK, N. Y.

BRANCHES

PHILADELPHIA, PA., Stephen Girard Building
BOSTON, MASS., 141 Milk Street

COLUMBUS, OHIO, 243 No. High Street

CLEVELAND, OHIO, Penton Building
DETROIT, MICH., General Motors Building

Construction and Repair Service

The services of the AMERICAN CHIMNEY CORPORATION cover every phase of chimney construction and repair, and include:

Radial Common Brick Chimneys
Ornamental Chimneys
Reinforced Concrete Chimneys

Boiler Settings
Incinerator, Garbage, Rubbish, etc.
Lightning Rods

Necessary Information for Estimates

When asking for information or estimates on new construction, or repair or extension of existing chimneys, kindly advise on the following points:

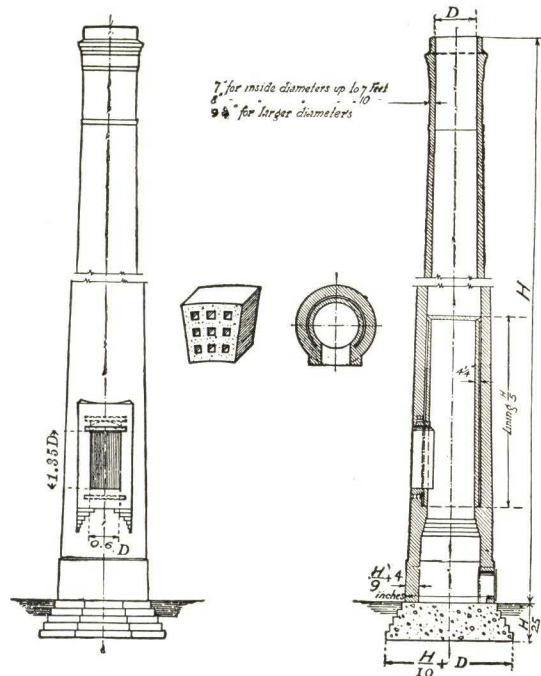
- (1) Intended use of chimney (boiler furnace, smelter, chemical plant, incinerator).
- (2) Height above foundation and diameter or boiler horsepower or number and dimensions of boilers.
- (3) If a bid is desired on foundation, give character of soil.
- (4) Does chimney stand independent of

building? If it is a part of the building, state for what height.

(5) Give hauling distance from purchaser's railroad siding or nearest railroad freight yard.

(6) If possible, give approximate prices of building materials and wage scale of local common labor.

Estimates furnished on inspection and repair of lightning rods, refractory linings for steel stacks, boiler brickwork and construction and repair of industrial furnaces.



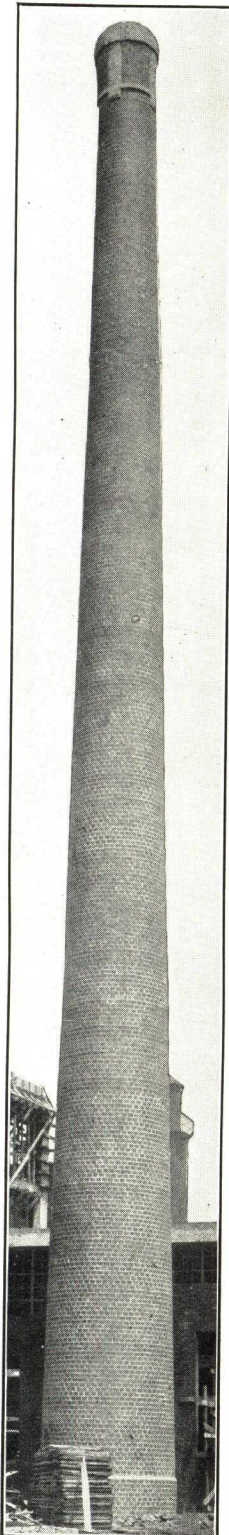
Design Data—Chimney for Boiler Operation

Determining Chimney Dimensions

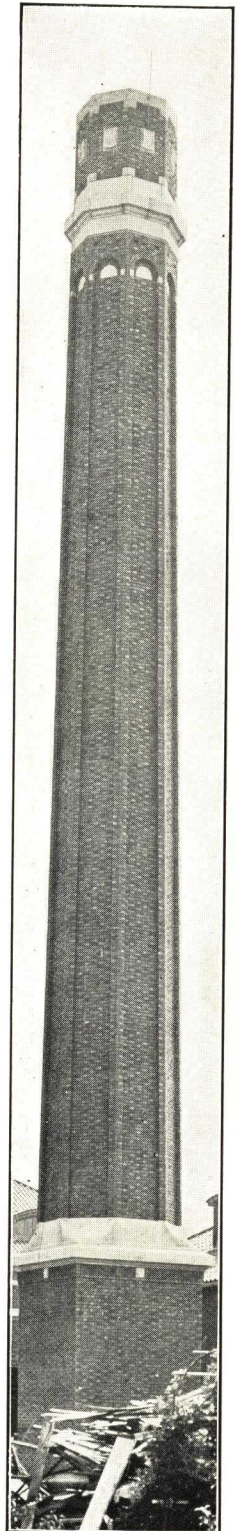
The principal dimensions of a chimney can be determined on the basis of our line drawing. To determine the bottom outside diameter of chimney use the following:

$H/D = 15$; increase outside diameter of chimney by 2 ft. 3 in. for 100 ft. in height.
 $H/D = 20$; increase outside diameter of chimney by 4 ft. for 100 ft. in height.
 $H/D = 30$; increase outside diameter of chimney by 4 ft. 6 in. for 100 ft. in height.

Lining—A refractory lining should be provided in every instance. It should be equal to at least one-fifth of the height of the chimney in case of boiler plants; one-half height of the chimney for stacks carrying temperatures of 800° to 1200°, and a high grade fire brick lining for the entire height is necessary in case temperature exceeds 1500°.



American Preserve Co., Philadelphia, Pa.
Chimney 150 ft. x 5 ft.



House of Good Shepherd, Albany, N. Y.
Chimney 100 ft. x 5 ft.

CONTINENTAL CHIMNEY COMPANY, INC.

Engineers and Contractors

TELEPHONE
Dearborn 6607

127 North Dearborn Street
CHICAGO, ILL.

BRANCH OFFICES

CLEVELAND, OHIO, Hunkin-Conkey Building

KANSAS CITY, MO., 2517 Jefferson Street

LOUISVILLE, KY., 420 Baxter Avenue

Products and Services

Designers and builders of PERFORATED RADIAL BRICK CHIMNEYS and FACE and COMMON BRICK CHIMNEYS, with foundations, for boilers, furnaces, smelters, ovens, etc., for all types of buildings.

We specialize in Lining and Relining Steel Stacks for large power and industrial plants.

Specifications, plans, designs and other information furnished free on request.

Perforated Radial Brick Chimneys

The purest materials only are used in making the radial blocks and are chosen for their great refractory qualities and high crushing strength.

These materials are so combined in the proper proportions as to insure a chimney with the maximum resistance to strains of every nature to which it may be subjected.

Radial bricks can be furnished in red or light buff color as desired.

Chimney Repairs

We repair all types of chimneys, making a specialty of brick and concrete stacks. For many years we have repaired the chimneys of some of the largest industrial plants in the country. Old chimneys repaired, straightened, heightened, pointed and banded while in operation. Lightning conductor systems inspected, repaired and installed.

We also make inspections of chimneys and will furnish reports on their condition without cost.

Information Required for Estimates

Name of place where chimney is to be erected.

Railroad siding on which it is located.

Distance from siding delivery to chimney site.

If for boiler draft, give total horsepower.

Kind of fuel or coal to be used.

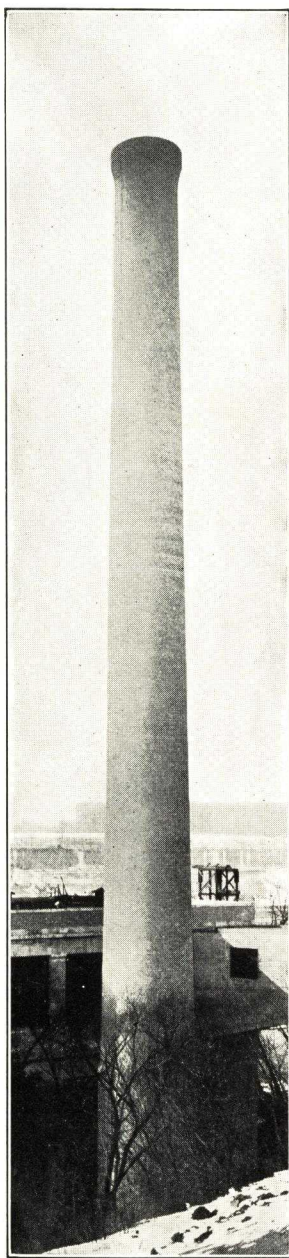
Dimensions of chimney required—diameter; height.

Nature of soil where chimney will stand.

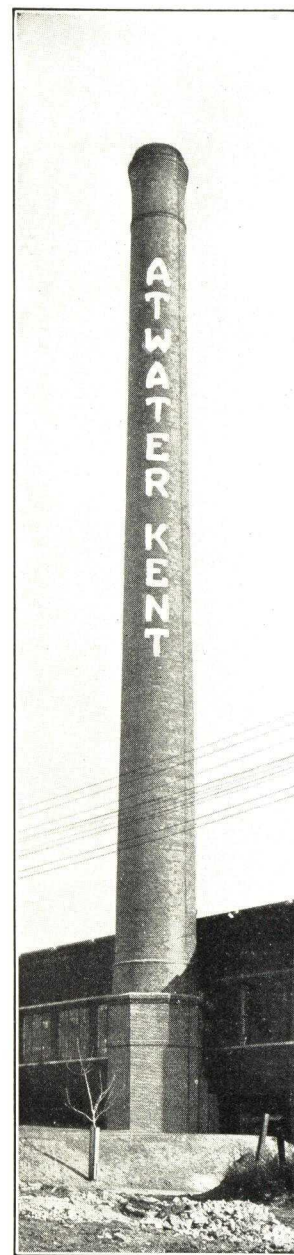
Estimated safe load per square foot.

Depth of excavation necessary to reach good soil.

Local prices—common brick, lime, cement and sand.



Chimney 250 Ft. High by 12-ft.
Top Inside Diameter, for
Ford Motor Co.,
St. Paul, Minn.



Chimney 175 Ft. High by 8-ft.
Top Inside Diameter, for
Atwater Kent Mfg. Co.,
Philadelphia, Pa.

ALPHONS CUSTODIS CHIMNEY CONSTRUCTION CO.

TELEPHONE
Cortlandt 7-8427

95 Nassau Street, NEW YORK, N. Y.
CHICAGO, ILL., Marquette Building

CABLE ADDRESS
"Custos, New York"

AMERICAN BRANCH OFFICES

ATLANTA, GA., Title Building
BALTIMORE, MD., 119 E. Lombard Street
BOSTON, MASS., 51 Ellery Street
CLEVELAND, OHIO, 406 Caxton Building
CINCINNATI, OHIO, 18 E. 4th Street
DETROIT, MICH., 729 Seward Avenue

INDIANAPOLIS, IND., 909 Roosevelt Building
LOS ANGELES, CAL., 804 Central Building
MILWAUKEE, WIS., 1107 Knapp Street
MINNEAPOLIS, MINN., 459 N. W. National
Life Insurance Building
PHILADELPHIA, PA., Perry Building
PITTSBURGH, PA., 420 Bessemer Building

PORTLAND, ORE., 1119 Failing Building
RICHMOND, VA., 301 American National Bank Building
ST. LOUIS, MO., Syndicate Trust Building
SAN FRANCISCO, CAL., Sheldon Building
SEATTLE, WASH., L. C. Smith Building

CUSTODIS CANADIAN CHIMNEY COMPANY, LTD.

HALIFAX, N. S., 172-74 Lower Water Street

QUEBEC, QUE., 140 St. John Street

MONTREAL, QUE., Architects Building, 1135 Beaver Hall Hill

TORONTO 2, ONT., 250 Confederation Life Building

BRITISH COLUMBIA: C. C. Moore & Co., Standard Bank Building, VANCOUVER, B. C.

Products

PERFORATED RADIAL BRICK CHIMNEYS.
REINFORCED CONCRETE CHIMNEYS.
ACIDPROOF CHIMNEYS.

HIGH TEMPERATURE CHIMNEYS.

CHIMNEY REPAIRS.

CHIMNEYS HEIGHTENED.

LIGHTNING RODS.

BOILER SETTINGS.

REFRACTORY BRICKWORK.

ACIDPROOF MASONRY CONSTRUCTION.

"ACO" CHEMICAL BRICK.

"HOECHST" ACIDPROOF CEMENT.

Engineering Service

Specifications, plans, designs and data regarding any of our products furnished free upon request.

Our 70 years experience enables us to give expert advice as to the proper chimney and foundations for any conditions, also the methods and modern practice in refractory brickwork and acidproof masonry.

Perforated Radial Brick Chimneys

The perforated radial blocks are made only from the purest clays, selected for high refractory powers and high crushing strength. All the radial blocks are formed to suit the circular and radial lines of each part of the chimney, so that they can be laid with thin, even joints and produce a regular smooth surface.

Moulded with vertical perforations, the radial blocks are most thoroughly and uniformly burned, materially increasing their density and strength.

Reinforced Concrete Chimneys

A monolithic tapering structure built of concrete reinforced vertically and horizontally with deformed steel rods and elec-

trically welded rectangular wire mesh. This reinforcing is accurately determined and distributed in the walls to properly take all the stresses due to weight, wind and temperature. Forms both inside and out are made of steel. They can be adjusted to insure an accurate taper and any desired wall thickness.

Acidproof Masonry

We construct acidproof masonry, the linings of tanks, towers, scrubbers, drains, etc., in connection with chemical plants and all other industries using acidproof masonry.

We furnish acidproof bricks and shapes and acidproof mortar to those companies who do their own construction work.

Write for literature and prices on our "ACO" brand chemical bricks and "Hoechst" chemical setting acidproof mortar.

Boiler Settings and Refractory Brickwork

We maintain a department for the setting of new boilers; overhauling of old boiler settings; the construction of oil stills, industrial furnaces and similar installations.

Repairing and Heightening

We repair brick chimneys, concrete chimneys and steel chimneys. Work done while in operation, if necessary.

We heighten old chimneys without interruption to the plant.

We demolish old brick, concrete and steel chimneys without danger.

We inspect all kinds of chimneys and make reports and recommendations on their condition.

Lightning Rods

Lightning rods installed and repaired.

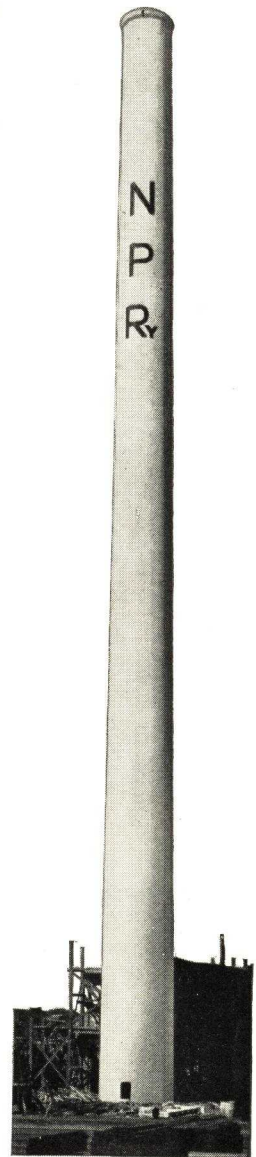
Text Book

Send for the free set of Custodis Text Books, S. E. 9, a technical treatise on the design and static calculations of chimneys and the determination of their proper sizes for particular installations. It is replete with valuable and heretofore unpublished information.



Tallest and Largest Radial Brick Chimney in the World, Anaconda Copper Mining Company, Anaconda, Mont.

Height above grade, 585 ft. Inside diameter at top, 60 ft. Built in 1918



Reinforced Concrete Chimney, Northern Pacific Railway, St. Paul, Minn.

Height, 208 ft. Inside diameter at top, 8 ft.

THE M. W. KELLOGG COMPANY

Manufacturers of Perforated Radial Brick Chimneys

225 Broadway
NEW YORK, N. Y.

BIRMINGHAM, ALA.
DETROIT, MICH.

BOSTON, MASS.
LOS ANGELES, CAL.

BRANCH OFFICES
CHICAGO, ILL.
PHILADELPHIA, PA.

CINCINNATI, OHIO
PITTSBURGH, PA.

CLEVELAND, OHIO
RICHMOND, VA.

CANADIAN KELLOGG CO., LTD., MONTREAL, QUE., TORONTO, ONT., WINNIPEG, MAN.

Products

Designers and Builders of PERFORATED RADIAL BRICK CHIMNEYS; REINFORCED CONCRETE CHIMNEYS; ACID-PROOF CHIMNEYS; HIGH TEMPERATURE CHIMNEYS.

REPAIRING and HEIGHTENING OLD CHIMNEYS; LIGHTNING RODS installed and repaired.

IGNISITE HIGH TEMPERATURE CEMENT; CASTIC DRY MONOLITHIC REFRACTORY; KALOLITH PLASTIC MONOLITHIC REFRACTORY.

Service

THE M. W. KELLOGG COMPANY has erected some of the finest chimneys in the United States during the last thirty years, and is ready to share the results of that experience with engineers and architects who are engaged in problems where chimney construction is required.

This Company's engineers will be glad to advise on types, sizes, shapes, etc., of chimneys for any conditions that may exist.

Kellogg Perforated Radial Brick Chimneys

No artificially produced material for the construction of the modern factory chimney compares with refractory clay.

This raw material is put through a variety of scientific treatments by skilled hands and especially designed machines before it comes from the kilns in the form of perforated radial brick ready for shipment, and for use in chimney construction.

Bricks are made to conform closely with the circular and radial lines of the shaft and are weatherproof and acid-proof.

The perforations in the radial bricks form a dead air space about the core of the chimney. This has a marked effect in reducing amount of fuel used, in preventing sudden changes in temperature within

the chimney, and in reducing radiation. Thus a uniformly maximum draft is maintained in any kind of weather.

Reinforced Concrete Chimneys

Concrete chimneys are constructed by steel forms for both the inside and the outside and are adjusted to insure accurate taper and desired

wall thickness. Concrete chimneys are reinforced vertically and horizontally with steel bars and electrically welded rectangular wire mesh.

Repairing and Heightening

Brick chimneys, concrete chimneys and steel chimneys repaired. We can perform work while chimney is in operation. We heighten old chimneys without interruption to plant. Brick, concrete and steel chimneys demolished without danger. Inspections of all kinds of chimneys and reports and

recommendations made.

Lightning Rods

We install and repair lightning rods.

Refractory Products

Ignisite High Temperature Cement, for bonding all forms of brickwork.

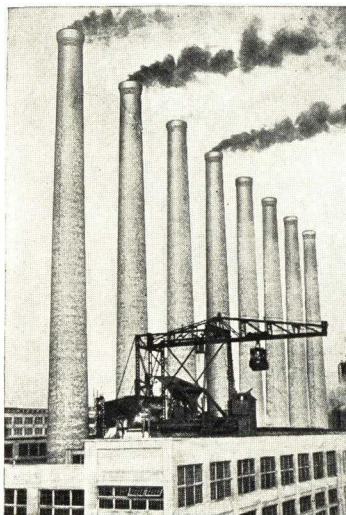
Castic Dry Monolithic Refractory, a castable monolithic material.

Kalolith, a plastic monolithic refractory.

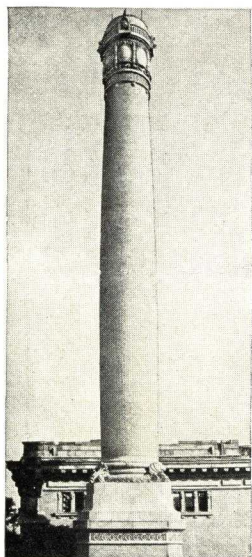
Thermotic, a plastic insulating material.

Standard Specifications

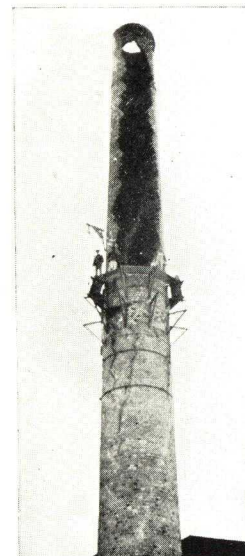
Send for free set of M. W. Kellogg Standard Specifications giving complete information as to sizes, design, weights, etc., of chimneys, including a detailed specification. We will also be glad to send complete literature on all our Refractory Products.



Corn Products Refining Co., Argo, Ill.



Queen Lane Filter Plant, Philadelphia, Pa.



Repairing Chimney, Bethlehem Steel Co., South Bethlehem, Pa.

NORTH AMERICAN REFRACTORIES COMPANY

ASHLAND FIRE BRICK CO.
CRESCENT REFRACTORIES CO.
SAVAGE MOUNTAIN FIRE BRICK CO.

A CONSOLIDATION OF
DOVER FIRE BRICK CO.
ELK FIRE BRICK CO.

FARBER FIRE BRICK CO.
QUEENS RUN REFRACTORIES CO., INC.
UNITED STATES REFRACTORIES CO.

GENERAL OFFICES

National City Bank Building, CLEVELAND, OHIO

SALES OFFICES

BOSTON, MASS., 89 Broad Street
BUFFALO, N. Y., Ellicott Square

CHICAGO, ILL., 59 E. Van Buren Street
NEW YORK, N. Y., 50 Church Street

PHILADELPHIA, PA., Otis Building
PITTSBURGH, PA., Oliver Building

CANADA, North American Refractories Ltd., 20 Jarvis Street, Hamilton, Ont.

NORTH AMERICAN BRICK FOR EVERY REFRACTORY NEED

Practically every type and quality of fire brick is produced. Processes include hand press, steam press and dry press. Seventeen modern plants located in Missouri, Maryland, Pennsylvania, Ohio and Kentucky, assure lowest possible freight rates. With extensive raw material deposits convenient to the plants, North American is especially equipped to make special shapes, sizes and grades. Large stocks of standard sizes and shapes located at strategic points insure prompt shipments.

With the combined experience of eight associated companies NORTH AMERICAN REFRACTORIES COMPANY offers users of refractories unusual facilities. The service of its experienced engineering department is fully available for consultation on any refractory problem.

Clay Fire Brick

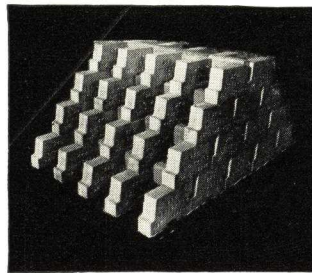
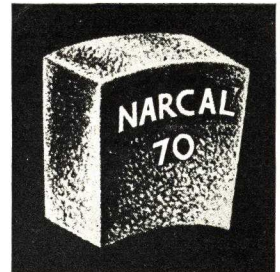
North American Fire Brick is made in all standard sizes and shapes to meet every refractory need. Marketed under 46 well-known brands. Special sizes and shapes can be made to order on short notice. Finely ground and screened fire clay is available for each brand.

Silica Fire Brick

North American Silica Brick is the reliable quality-tested Mt U brand, formerly manufactured by United States Refractories Company. It is made in all standard shapes and sizes as well as special shapes for special uses.

Narcal High Alumina Fire Brick

Where service conditions require a better refractory than standard high quality fire brick, use Narcal High Alumina Brick. Proved by use-tests to possess the necessary resistance to extremely high temperatures and adverse slag conditions. Made in 4 grades, 50%, 60%, 70% and 80% alumina, to meet every need. Stocked in 9-in. straights, but made in 9-in. series and liner blocks on special order.



Loftus Checker Brick

(Patented.)

The Loftus Checker Brick construction eliminates cold centers (inert volumes), insures complete heat penetration, minimizes furnace dust collection and accelerates both incoming and outgoing gases, thus making for more efficient operation of the furnace. Write for literature.

NORTH AMERICAN REFRACTORY CEMENTS FOR EVERY SERVICE CONDITION

NORTH AMERICAN REFRACTORIES COMPANY produces a complete line of cements and plastics. Ownership and control of clay beds, specialized mining operations, exacting laboratory requirements and modern processing machinery combine to assure absolute reliability. North American is well equipped to produce special cements where the standard products do not meet unusual conditions.

Narcoset High Temperature Bonding Mortar



Here is a plastic, ready-to-use high temperature mortar which sets hard at room temperature. The uses to which Narcoset may be put are many. While it is primarily used for laying-up fire brick, this cement also makes an excellent facing material. Where dipped joints are desired, adding water reduces it to proper consistency. It also serves as a strong bonding material for crushed fire brick in making patching material. Does not overfire or crack even at the highest furnace temperature, and because of its negligible shrinkage, comparatively thick joints may be used.

The chemical and physical properties of Narcoset are practically the same as those of the highest grade fire brick. Shipped in 100, 200 and 500-lb. airtight steel drums.

Narco Plastics

Scientifically prepared materials—the result of wide experi-

ence and many years of close contact with thousands of industrial customers. Although designed primarily as patch materials they are capable of extended use in the original installation of furnace linings.

No single refractory material can satisfactorily meet the great range of temperature and physical conditions encountered in all types of industrial furnaces. Hence North American has perfected two plastics, Narco 505 for high temperatures and Narco Hearth for medium temperatures.

Only the best grades of calcined and the raw materials suitable for the purpose are used. As a great portion of this plastic is pre-shrunk at a high temperature, and extreme care is taken in sizing and mixing, practically no shrinkage will occur either in drying or firing. Not intended as a mortar nor as a coating for fire brick walls as is Narcoset.

Narco 505—For furnace temperatures from 2200° to 3100°. Sets firm at 1600° but does not attain a completely burned set until about 2400°. Comes ready for use and will keep almost indefinitely. Shipped in 500 and 200-lb. airtight steel, non-returnable drums.

Narco Hearth—For furnace temperatures up to 2400°. Resists flash temperatures in excess of recommended range and does not develop a "soft spot" between 1500° and 1800°. Ready for use with the addition of water enough to produce the required working consistency. Shipped in 100-lb. paper-lined cloth sacks.

Narcobond—A cold set silica cement for use where regular silica cement is not indicated. Made in three types having distinct physical properties. Our engineering department should be consulted for proper application.



Narco No. 99 Hot and No. 101 Cold Set Cement (Dry)

Narco (formerly Crescent) Cement is a quality material, made for either hot set or cold set uses. This is a dry cement, being finely ground, so as to permit of thin joints but with shrinkage low enough that thick joints are practical. Narco No. 99 is the hot set variety which is shipped either in bulk or in 100-lb. paper-lined jute bags. Narco No. 101 is the cold set cement. This is shipped in dry form in 100-lb. paper-lined jute bags only.

THE BABCOCK & WILCOX COMPANY

GENERAL OFFICE
85 Liberty Street
NEW YORK, N. Y.

BRANCH OFFICES

ATLANTA, GA., Candler Building
BOSTON, MASS., 49 Federal Street
CHICAGO, ILL., 20 North Wacker Drive
CINCINNATI, OHIO, Carew Tower
CLEVELAND, OHIO, Guardian Building
DALLAS, TEX., Magnolia Building
DENVER, COLO., 444 Seventeenth Street
DETROIT, MICH., Ford Building

GALVESTON, TEX., Security Building
HOUSTON, TEX., Electric Building
LOS ANGELES, CALIF., Edison Building
NEW ORLEANS, LA., 344 Camp Street
NEW YORK, N. Y., 85 Liberty Street
PHILADELPHIA, PA., Packard Building
PHOENIX, ARIZ., Luhr's Tower
PITTSBURGH, PA., Koppers Building

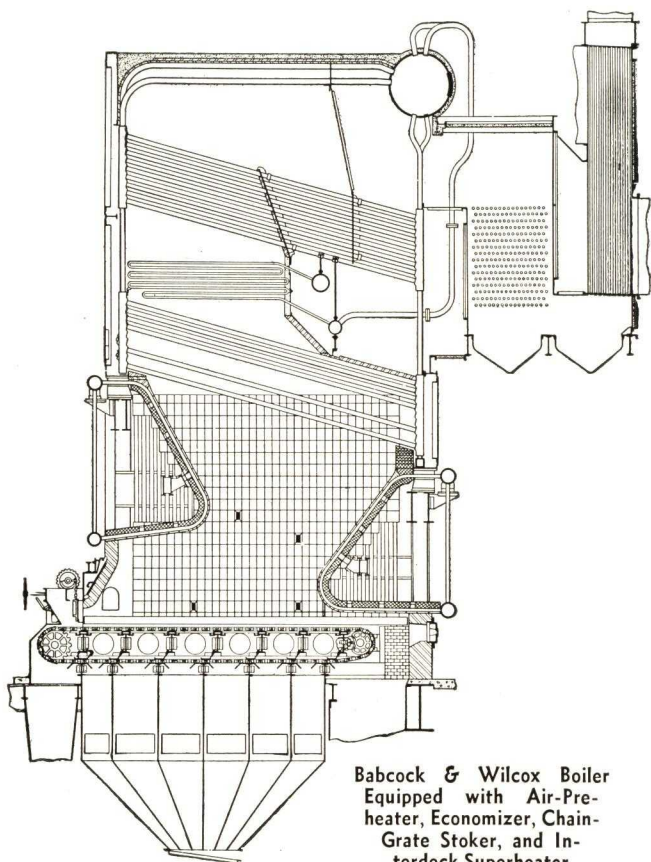
PORTLAND, ORE., Failing Building
SALT LAKE CITY, UTAH, Kearns Building
SAN FRANCISCO, CALIF., 450 Mission Street
SEATTLE, WASH., Smith Tower
SAN JUAN, P. R., Recinto Sur 45
TULSA, OKLA., Philtower Building
HAVANA, CUBA, Calle de Aguir 104
HONOLULU, T. H., Castle & Cooke Building

B & W Boiler

High efficiency, compactness, flexibility of construction, the ability to deliver dry steam at high ratings, and the ease with which it may be cleaned are features of the Babcock & Wilcox Boiler.

The design provides great latitude in the width, height, or length of boiler for various conditions of plant space and layout, methods of firing, and fuels. Where a superheater is required, it may be of any size and can be located in the over-deck position or between decks of generating tubes according to the amount of superheat required.

Boilers of this type are available in sizes ranging in steam output up to and above 1,000,000 lb. per hour with auxiliaries, and for any pressure now used in power-plant practice.



Babcock & Wilcox Boiler
Equipped with Air-Pre-
heater, Economizer, Chain-
Grate Stoker, and In-
ter-deck Superheater

Stirling Boiler

The Stirling Boiler is the result of progressive improvement in design since the original design was patented in 1888.

The adaptability of this boiler for various requirements is

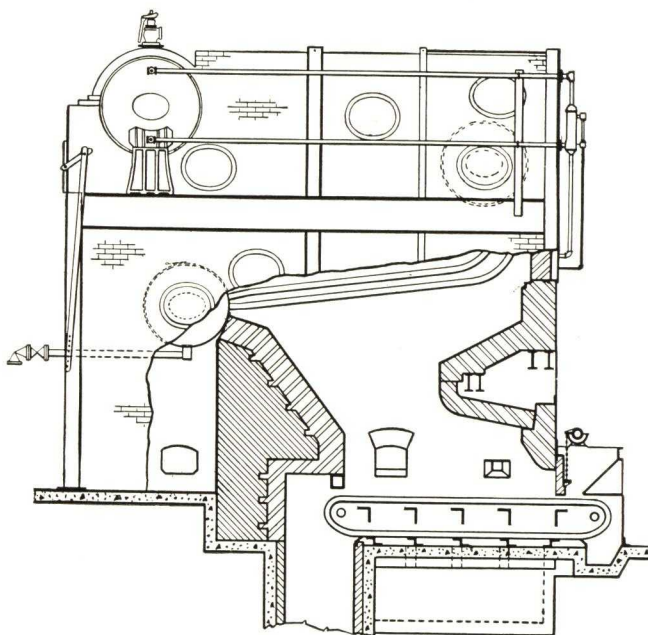
evidenced by the number of classes or wide range of sizes in which it is built, the ample space provided for a superheater, and the ability of the boiler to utilize any kind of fuel. The number of gas passes may likewise be selected to suit the requirements of individual installations by employing the conventional three-pass design, the four-pass arrangement, or the patented single-pass design. The efficiency of the unit may be varied by the addition or omission of air heaters and economizers.

The entire unit is supported on a steel framework independently of the brickwork and is readily accessible for inspection, cleaning or repair. Any tube may be renewed without disturbing any other tube or the simple brickwork setting.

This boiler has been built in sizes to deliver from 3,000 to 335,000 lb. of steam per hour and for pressures up to 1390 lb. per sq. in.

Type H Stirling Boiler

Developed primarily for heating and process work, but admirably adapted for the smaller power plant, the Type H Stirling Boiler has unusual steaming capacity for the low head-room and floor space required. It is available in sizes ranging from 714 sq. ft. of heating surface to 5071 sq. ft.



Type H Stirling Boiler with Chain-Grate Stoker
This boiler can also use other methods of firing

Waste-Heat Boilers

Babcock & Wilcox Waste-Heat Boilers are used extensively in steel mills, cement plants, and for a wide range of waste-heat

recovery services. They are available in water or fire-tube types, and, according to the type, are successfully used for noxious or poisonous gases, or for those of high dust content.

B & W Return-Bend Economizer

Sturdy construction employing forged return-bend fittings, which insure smooth flow of water, and the protection of the return-bend fittings by gas-tight partitions are features of the B & W Economizer. All parts are readily accessible for inspection, cleaning, and repair. It is built in all sizes required for power plant service and used for pressures up to 1400 lb. per sq. in.

B & W Steam Superheater

B & W Superheaters are of the single or multi-loop types, and are available for various types of boilers and operating conditions. Even distribution of steam through the tubes and effective supports are two features of importance. They are also adaptable to separate firing.

B & W Air Preheater

The B & W Air Preheater is of the tubular type and is so assembled that it is inherently tight. The general design and arrangement of baffles is such that the gas sweeps over all the tube surface at a uniform velocity, eliminating dead-gas pockets, which are a common source of air-heater corrosion.

The B & W Air Preheater may be applied to boilers, or it may be arranged for separate firing in process work.

B & W Chain-Grate Stoker

B & W Chain-Grate Stokers are available in three types, all of which are suitable for burning any free-burning, non-coking bituminous coal, as well as anthracite, coke, or lignite.

The Standard Type may be used with natural, induced or forced draft, and is available in sizes up to 138 sq. ft. of effective grate surface.

The Intermediate Type is for use with forced draft, and is

made in sizes from 90 to 235 sq. ft. of effective grate surface.

The Heavy Duty Type is used with forced draft in large installations, and varies in size from 270 to 615 sq. ft. of effective grate surface.

Pulverized-Coal Equipment and Water-Cooled Furnaces

THE BABCOCK & WILCOX COMPANY has developed pulverizing, burning, and water-cooled furnace equipment, for storage or direct-fired systems, which permits the full advantages of pulverized-coal firing to be realized in boiler units of practically all sizes. This equipment has been developed on basically sound principles, and has proved its utility in many central-station and industrial applications.

The pulverizers have the ball and grinding-ring principle of pulverizing whereby fineness and capacity are unaffected by wear of the grinding parts. They range in capacity from $\frac{1}{4}$ ton to 50 tons per hour.

The burners, which are of the turbulent type, provide for the mixing of the fuel and air at the burners, thereby effecting combustion in a short flame.

Bailey Water-Cooled Furnace Construction meets the requirements of high capacity, availability, and efficiency over a wide range of heat liberation with low maintenance. It is applicable to all fuels and methods of firing.

B & W Oil Burners

B & W Mechanical-Atomizing Oil Burners are highly efficient at all rates of fuel feed because of the turbulent mixing of the fuel and air effected by scientific atomization, and correct direction of the air. They will handle all commercial grades of fuel oil and are adaptable to operation with natural or forced draft.

These burners are available in a range of heat-liberating capacities that meet every industrial requirement.

B & W No. 80 Refractories

B & W No. 80 Refractories, comprising firebrick, five mortars and plastics, insulating firebrick, and glass-tank blocks, are made of specially processed Kaolin. The group is particularly adapted for use where operating conditions are unusually severe and where fireclay products either are unsuitable or deteriorate rapidly.

Special Castings and Forgings

Elverite—Elverite is a chilled-cast-iron product that is widely used in the reduction and pulverization of rock products, cement clinker, ores, and other materials that require resistance to abrasion. It is unexcelled for long life in this service.

Adamantine—Adamantine is especially serviceable in withstanding severe abrasion combined with heavy strains where machinability of surfaces is required. Adamantine is a superior grade of manganese-chromium steel available in cast or forged shapes.

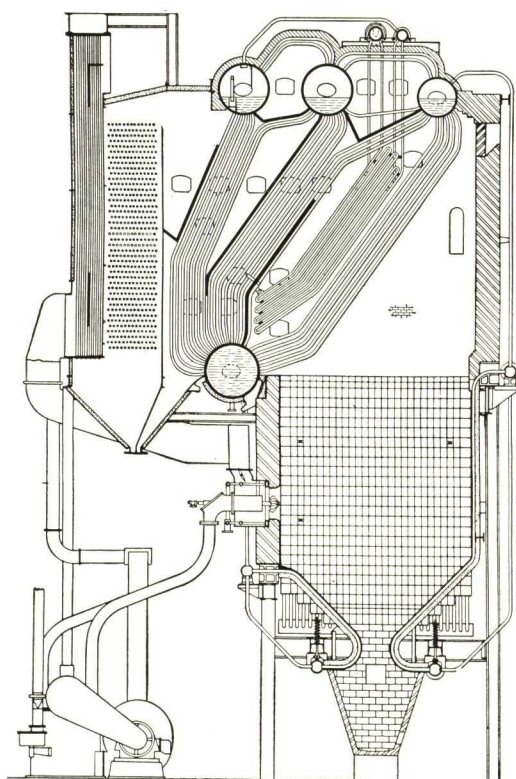
Alloy Castings—Babcock & Wilcox Alloy Castings are available in more than twenty standard analyses for resistance to high pressure, high temperature, and corrosion.

New and improved production methods developed by this Company assure castings of definite and known chemical composition, uniform machinability, and free from blow-holes, shrinkage cracks, and porosity.

Special Process Equipment

B & W Special Process Equipment includes vessels, drums, castings, forgings, and tubular products whose application is indicated by the following list of typical products:

Oil Drums	Tar Stills
Gasoline Towers	Digesters
Vacuum Chambers	Penstock Piping
Expansion Chambers	Evaporator Shells
Accumulation Tanks	Alloy Castings



Stirling Boiler with Air Preheater, Economizer and Pendent Type Superheater

Pulverized-coal fired by Babcock & Wilcox Type B Pulverizer and Burners, and set over a Bailey Water-Cooled Furnace

ERIE CITY IRON WORKS

Boilers, Pulverized Fuel Equipment and Steam Engines

ERIE, PA.

SALES OFFICES

BALTIMORE, MD.
BINGHAMTON, N. Y.
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CINCINNATI, OHIO

CLEVELAND, OHIO
DENVER, COLO.
DETROIT, MICH.
HOUSTON, TEX.
LOS ANGELES, CALIF.
NEW ORLEANS, LA.

NEW YORK, N. Y.
NORFOLK, VA.
OKLAHOMA CITY, OKLA.
ORLANDO, FLA.
PHILADELPHIA, PA.
PITTSBURGH, PA.

PORTLAND, ORE.
ST. LOUIS, MO.
ST. PAUL, MINN.
SALT LAKE CITY, UTAH
SAN FRANCISCO, CALIF.
TORONTO, ONT.

PERNAMBUCO, BRAZIL, Ayres & Son, Recife

MANILA, P. I., Manila Machinery & Supply Company

Products

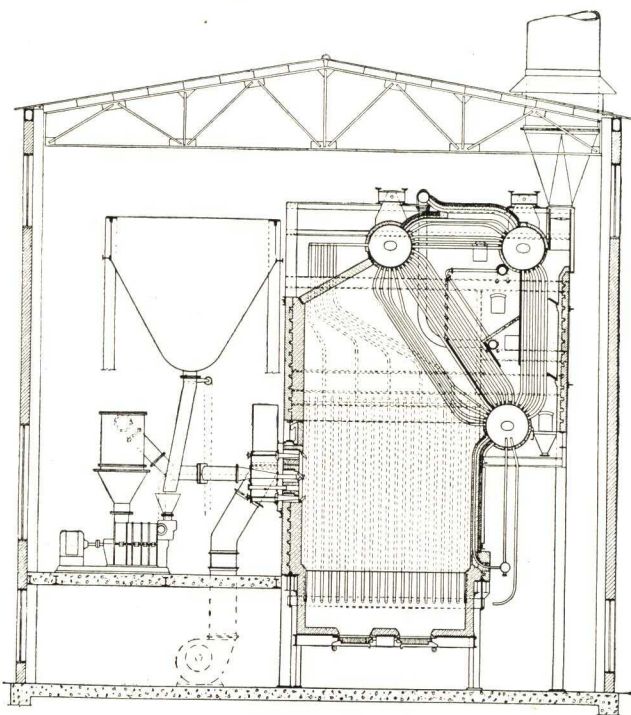
VERTICAL, HORIZONTAL, CROSS DRUM and INCLINED WATER TUBE BOILERS; ERIE CITY "ECONOMIC" SELF-CONTAINED BOILERS; ERIE CITY STEEL WELDED HEATING BOILERS; HORIZONTAL and VERTICAL FIRE TUBE BOILERS.

ERIE CITY UNITYPE PULVERIZERS.

ERIE CITY POWDERED COAL BURNERS.

Lentz Poppet Valve and High Speed Engines, Fabricated Steel Plate and Pressure Vessels.

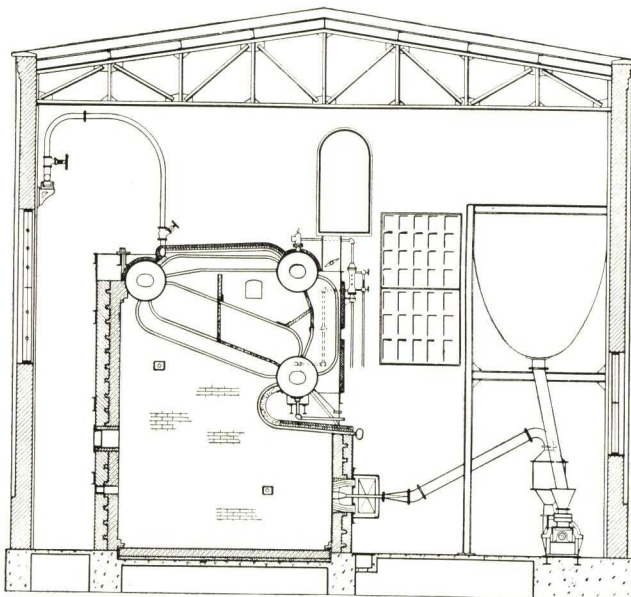
Erie City Type "A" Water Tube Boiler



The Type "A" three drum boiler is offered as a highly developed, economical unit for all general power plant purposes. It can be furnished with integral economizer, air preheater or both in combination. Built in sizes up to over 2,000 hp. and for any desired

pressure. Full details, layouts and estimates gladly furnished.

Erie City Type "C" Water Tube Boiler

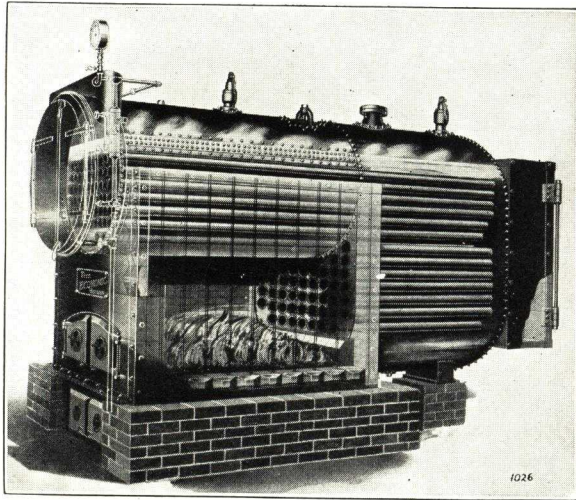


This Boiler is of the low head three drum type and is particularly adopted to restricted space conditions. The size range is from 100 to 600 hp. and can be built to any required working pressure. It conforms to any type of firing. Unlike other low head boilers, it produces dry steam at extremely high ratings. Literature sent promptly on request.

Erie City Unitype Coal Pulverizer

The two cuts on this page show typical installations of Erie City Pulverized Coal Equipment. The pulverizer is of the impact type, built either with or without classifier, in sizes varying from 1500 lbs. to 10,000 lbs. per hour. Construction is entirely of welded steel. Equipment includes fuel pipes and burners for all types of firing, complete furnaces and water cooled walls.

Erie City "Economic" Boiler



The "Economic" combines boiler, setting and steel casing, offering all the advantages of the Stationary Tubular Boiler. In addition, it can be readily moved as a complete unit when occasion requires and occupies a minimum of floor space. It is suitable for any kind of firing, stoker, oil or gas, as is evidenced by hundreds of successful installations of all these types. The following table gives overall dimensions.

DIMENSIONS OF 100-LB. ECONOMIC BOILER

No.	Hp.	Grate area, sq. ft.	Heat surface, sq. ft.	Length, ft.—in.	Width, ft.—in.	Height, ft.—in.	Total weight, approx., lb.
120	20	8.9	203	11—6	4—3	5—9	11,225
121	30	12	300	12—0	4—9	6—0	13,750
122	40	15	400	13—0	5—0	6—6	16,325
123	50	16.7	501	12—6	5—6	7—0	19,050
124	60	18.5	603	14—3	5—6	7—0	21,150
125	80	22.5	813	14—3	6—3	8—9	27,400
126	100	27	999	16—6	6—3	8—9	31,000
127	125	30	1250	16—9	6—9	9—0	35,600
128	150	32.5	1485	19—0	6—9	9—0	39,700
130	200	41.2	2002	20—6	7—3	10—0	49,950

These Boilers can be delivered promptly from stock in 100 lbs., 125 lbs. and 150 lbs. working pressures, built to the specifications of the A.S.M.E. Code. Full details furnished promptly on request.

Erie City Vertical Tubular Boiler

This Boiler is of the full length tube, extended shell type and is built in sizes from 4 to 110 hp. and from 100 lbs. pressure up. A large range of sizes and pressures is carried in stock for prompt delivery. It can be furnished with regular smoke hood or with cheese box type for side smoke outlet. Literature available on request.

Erie City Heating Boiler

This is an electric-welded boiler built in three types:

- (1) Smokeless for coal—with refractory covered curtain and bridge wall.
- (2) Up-draft—without refractory curtain.

(3) Oil, gas, or stoker fired—especially designed to meet the requirements of these firing methods. Large furnace volume is provided.

Each of these types is built in a wide range of sizes. They are shipped complete ready for installation.

Characteristics—Characteristics of the Erie City Steel Heating Boiler are:

- Large grate area and firebox.
- Correctly proportioned gas passages.
- Low draft loss.

The ratio of heating surface to grate area is above the average for boilers of this type.

The ratio of radiant heating surface to convection heating surface is also well above the average in this boiler.

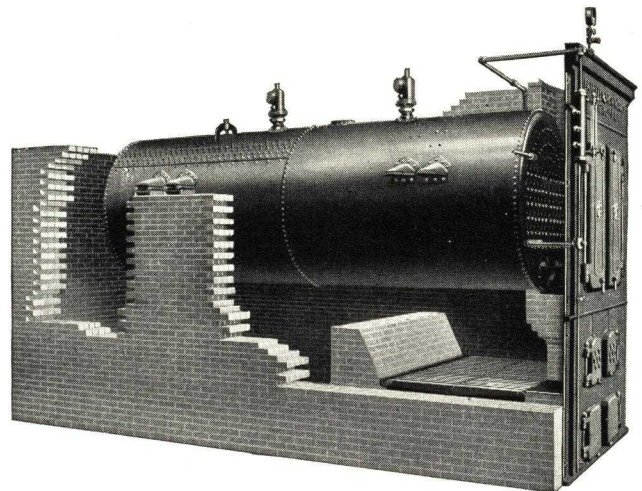
The following typical table shows range of capacities.

SERIES NO. 3—SMOKELESS FOR COAL

No.	Heating surface, sq. ft.	Grate area, sq. ft.	Capacity, sq. ft.		Shipping weight, lb.
			Steam	Hot water	
352	259	13.1	3600	5800	6500
353	301	13.1	4200	6700	7000
354	343	14.6	4800	7600	7500
355	375	16.3	5200	8400	8000
356	409	17.9	5700	9100	8500
357	449	17.9	6200	10000	9000
358	523	19.7	7300	11700	9800
359	600	22	8400	13400	10800
360	680	22	9500	15200	11750
361	803	24	11100	17800	13300
362	914	27	12700	20400	14650
363	1071	29.3	14900	23900	16500
364	1222	31.5	17100	27300	18500
365	1372	31.5	18100	29000	20500
366	1533	34.1	21000	33600	22400
367	1686	35.5	22600	36200	24300
368	1927	38.5	26400	42200	27250
369	2153	41.5	30100	48200	30000

Full details of all types furnished promptly on request.

Erie City Horizontal Return Tubular Boiler



The Erie City H.R.T. Boiler has been the standard of comparison for three generations. It embodies the most modern principles of design and is built with the same care and precision that characterizes the entire Erie City line. This is a standardized, reliable and dependable product. Shipped from stock in a wide range of sizes and pressures. Special sizes and specifications fabricated and delivered promptly.

E. KEELER COMPANY

ESTABLISHED 1864

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WILLIAMSPORT, PA.

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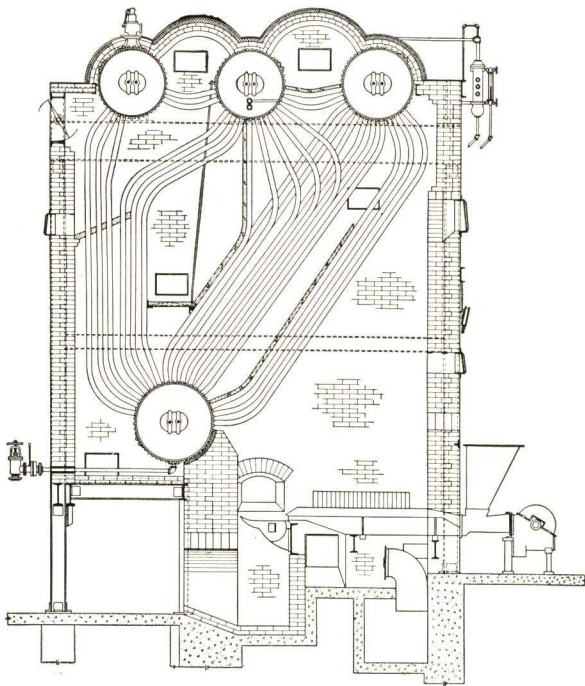
Products

STRAIGHT TUBE and BENT TUBE WATER TUBE BOILERS; WATER WALLS; HORIZONTAL RETURN TUBULAR and DOUBLE DUTY BOILERS; STEEL BREECHINGS, STACKS, TANKS and CASINGS.

Keeler Bent Tube Water Tube Boilers

The illustrations on this page show a few of the combinations of steam and water drums connected by curved tubes to meet various conditions.

The tubes are full sized, $3\frac{1}{4}$ ins. diameter, bent to a long easy radius. All tubes are carefully bent to a template and accurate records are preserved to insure correct replacements.

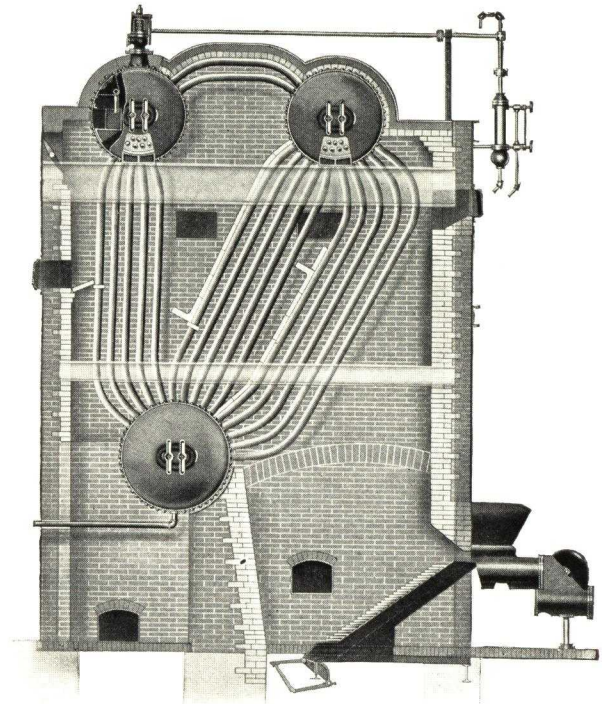


Keeler "DC" Class 4 Drum Bent Tube Boiler

Any tube in a Keeler Bent Tube Boiler can be removed and replaced without disturbing any other tube or connections.

The arrangement of baffle walls and the design of the furnace will be made to meet particular requirements of operation, fuel or furnace equipment to be installed.

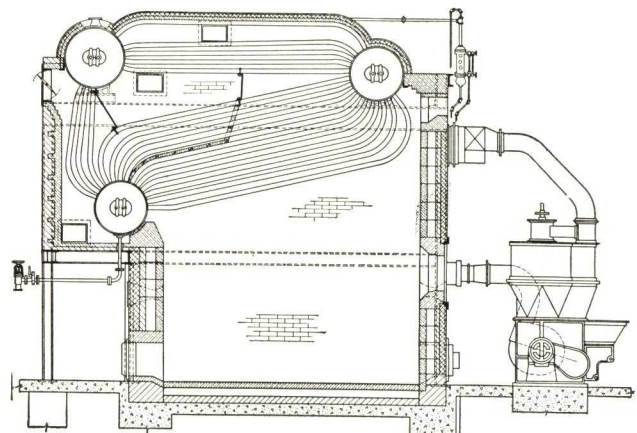
Special care is given in the design of the structural steel supporting framework to guard against a construction which would not permit ample expansion of both the boiler and the setting.



Keeler "V" Class 3 Drum Bent Tube Boiler

Types "DC" and "V," usually installed in large industrial and central station plants, require high headroom. For plants where headroom is limited, we suggest the use of Keeler Type "J." It is built in units up to 5000 sq. ft. of heating surface.

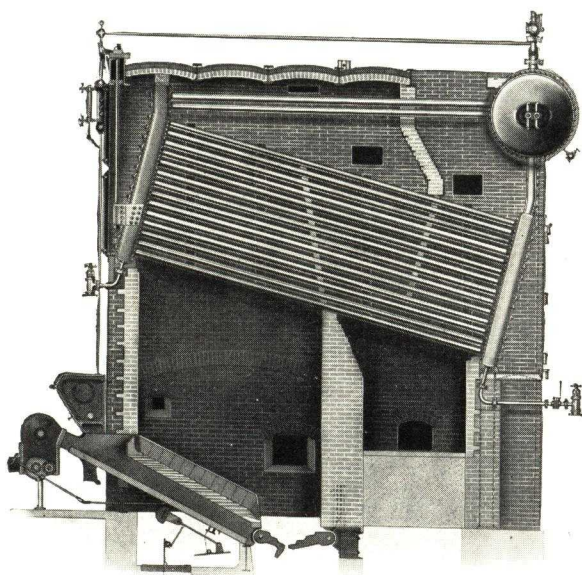
The roof tubes and drums above the normal water level are not included as heating surface when calculating boiler horsepower. Shiplap or monolithic baffles are used to direct the flow of gases so the boiler will absorb the maximum amount of heat.



Keeler Type "J" 3 Drum Low Head Bent Tube Boiler

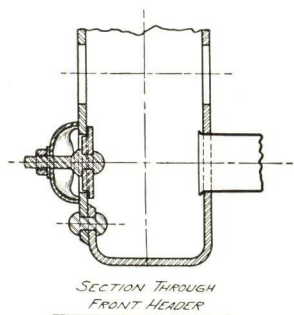
Keeler Straight Tube Water Tube Boilers

The tubes in the main bank of both the Cross Drum and Longitudinal Water Tube Boilers are straight.



Typical Setting 822 Hp. Cross Drum Boiler with Forced Draft Stoker

The tubes are inclined so as to properly influence the direction of circulation. They are in horizontal and staggered vertical rows and are expanded into headers.



The adjoining cut shows the latest development in box header construction. The trough is formed by flanging the tube sheet, making rivets unnecessary on the furnace side, bottom and ends of the header.

Rivets where used are protected by water on one end and open to inspection on the other.

The rivets and caulking edge are not concealed by brickwork. No dry rivets are used.

The joint is so constructed that scale cannot wedge between the plates and set up stresses due to expansion and contraction.

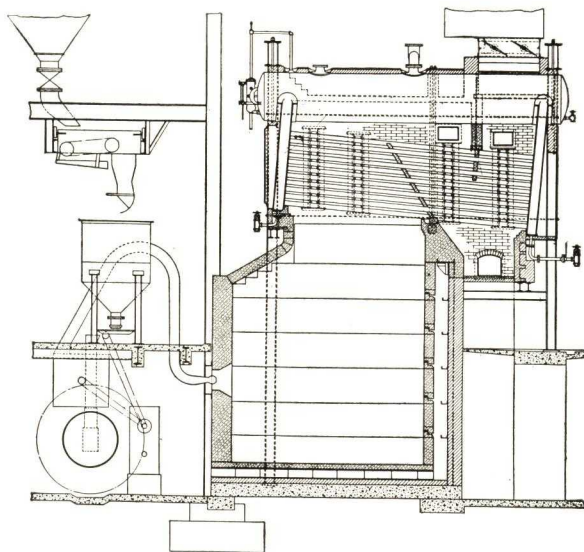
The headers are all wrought steel construction which provides equal expansion by maintaining uniformity of temperature of the water within the boiler.

The drum is rolled from a single plate eliminating intermediate girth seams. The manhole opening is placed in the drum head.

Feed water is introduced into the boiler through the drum head and is piped into a partially submerged mud drum where it deposits the heavier impurities which can be blown off through a drum blow-off pipe.

Main blow-off connections are provided from the bottom of the boiler header or water leg.

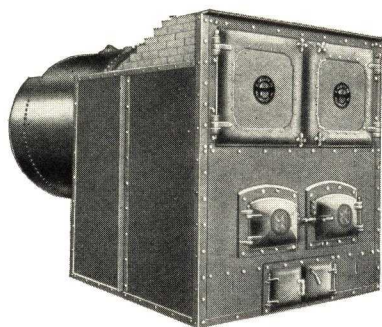
The front end of the Keeler Straight Tube Water Tube Boiler is suspended from overhead girders which



Typical Powdered Fuel Installation
500 hp. long drum boiler with air cooled walls

rest on steel columns placed at outside corners of the boiler setting. Method for support of rear end is optional.

Cast iron or cast steel are never used for pressure parts in Keeler Boilers.



Keeler Double Duty Boiler

A semi self-contained fire tube boiler

Built in sizes from 35 hp. to 250 hp., and in pressures of 100, 125 and 150 pounds. This boiler has no flat surfaces except the heads. This construction makes troublesome cross braces unnecessary

RILEY STOKER CORPORATION

WORCESTER, MASS.

WORKS: WORCESTER, MASS., DETROIT, MICH., AND CORNWELLS HEIGHTS, PA.

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RILEY ENGINEERING AND SUPPLY CO., LIMITED, TORONTO

Products

Complete Steam Generating and Fuel Burning Equipment; Boilers; Superheaters; Water-cooled Furnaces; Air Preheaters; Economizers; Steel Clad Insulated Settings; Flue Gas Scrubbers; all types of Mechanical Stokers; Pulverized Coal Equipment; Pulverized Coal Burners.

The Riley Stoker Corporation is in a position to furnish complete steam generating and fuel burning equipment for any desired steam output under one contract without division of responsibility.

Riley-Badenhausen Boiler

Riley-Badenhausen Boilers (1) employ the principle of ring flow circulation, assuring positive rapid circulation at all boiler ratings. This results in low flue gas temperatures and high efficiency. These boilers are of the three or four drum bent tube type and are built for all boiler pressures and steam outputs. Their flexible design permits their installation under extreme space limitations. Send for Catalogue SW-109.

Riley-Badenhausen Superheaters

Riley-Badenhausen Superheaters (2) are designed and manufactured as an integral part of the Riley-Badenhausen Boiler. The superheater surfaces, because of the flexible design may be installed in a number of different locations to give any desired steam temperature.

Riley-Badenhausen Water Cooled Furnaces

Riley-Badenhausen Water Walls (3) are made up of straight tubes rolled at each end into rectangular seamless steel headers, connected with the boiler drums by bent tubes entirely within the setting limits. Bulky steam and water circulation pipes outside the setting, with their

bulky and expensive covering are not required. Rapid positive circulation is also a feature of Riley-Badenhausen Water Walls. Maintenance is extremely low with this water wall. Send for Catalogue SW-110.

Riley-Badenhausen Air Preheaters

Riley-Badenhausen Air Preheaters (4) are of the tubular type of either single, two or three pass design. The design is extremely flexible, making possible a heater of the correct size for the amount of preheat desired. Send for Catalogue SW-112.

Riley-Badenhausen Economizers

Riley-Badenhausen Economizers are designed as an integral part of the boiler. These economizers are built in either single or two pass type, to give any desired amount of economizer surface. Send for Catalogue SW-113.

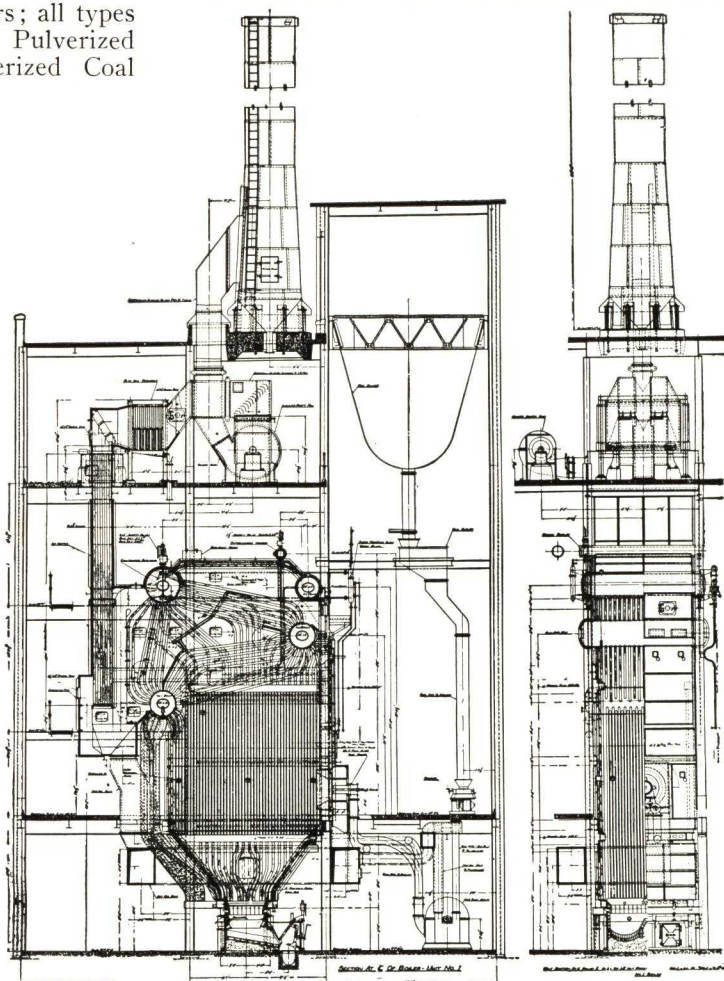
Riley-Badenhausen Steel Clad Boiler Settings

Riley-Badenhausen Steel Clad Boiler Settings are ordinarily used with Riley-Badenhausen Water Cooled Furnaces in which case refractory tile is placed

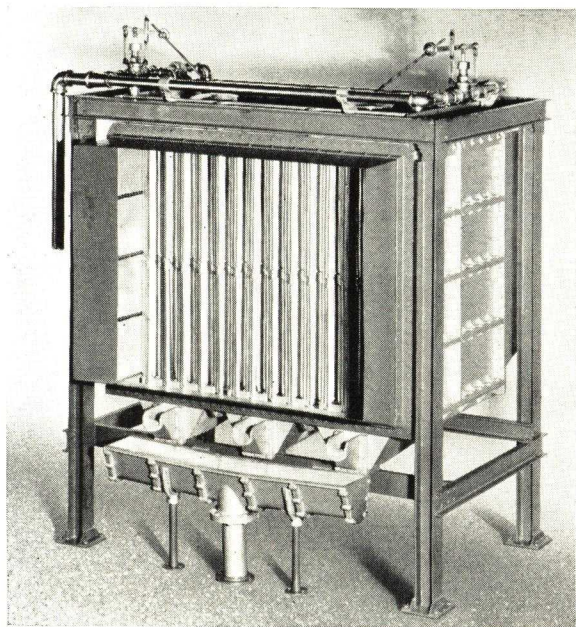
next to the water wall tubes and is backed up with special insulating material and a sheet steel casing. Send for Catalogue SW-114.

A Few Users of Riley-Badenhausen Units

Atwater Kent Mfg. Co., Philadelphia, Pa.	Lehigh Valley Coal Co., Wilkes-Barre, Pa.
Harnischfeger Corp., Milwaukee, Wis.	Hoskins Morainville Co., Menominee, Mich.
Northern Pacific Railway—3 plants	Sunbury Converting Works—2 plants
Aberfoyle Mfg. Co., Chester, Pa.	Forstmann Woolen Co., Passaic and Garfield, N. J.
Pennsylvania Sugar Co., Philadelphia, Pa.	Finch Pruyn & Co., Glens Falls, N. Y.
Columbia University, New York City	General Aniline Co., Grasselli, N. J.
Otter Tail Power Co.—3 plants	

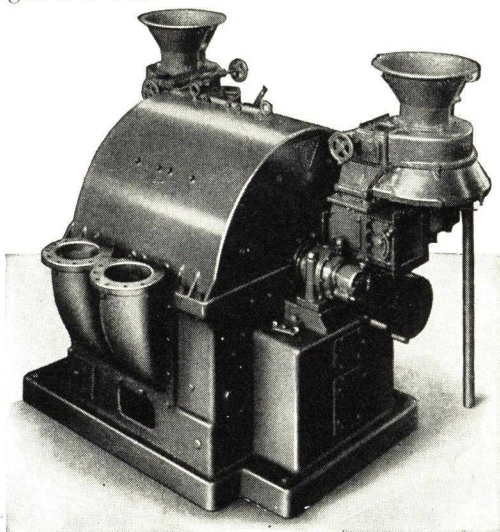


Installation of Complete Steam Generating Units at Forstmann Woolen Co., Passaic, N. J.



Riley Flue Gas Scrubber

The Riley Flue Gas Scrubber is a device for eliminating dust particles from flue gases by a washing process. It may not only be installed in connection with steam generating boilers for the elimination of fly ash but can be applied to any dust eliminating problem where a wet process is permissible. Dust from blast furnaces, smelters, cement kilns, scratching rooms or various other industrial processes where excessive amounts of dust is produced, can be eliminated by this type of scrubber. Send for Catalogue SW-115.



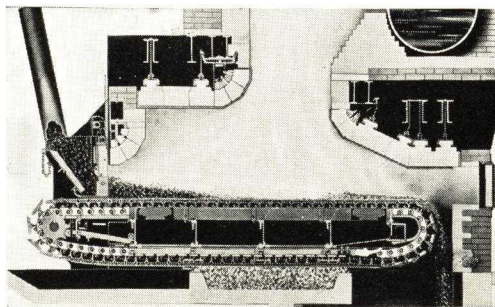
Riley Atrita Unit Pulverizers

Riley Atrita Unit Pulverizers are used in direct fired pulverized coal systems taking the raw coal from the bunker and discharging the pulverized coal direct to the burners. They are built in sizes having coal pulverizing capacities from 1500 pounds of coal per hour to 30,000 pounds of coal per hour. Send for Catalogue SW-92.

Riley Pulverized Coal Burners

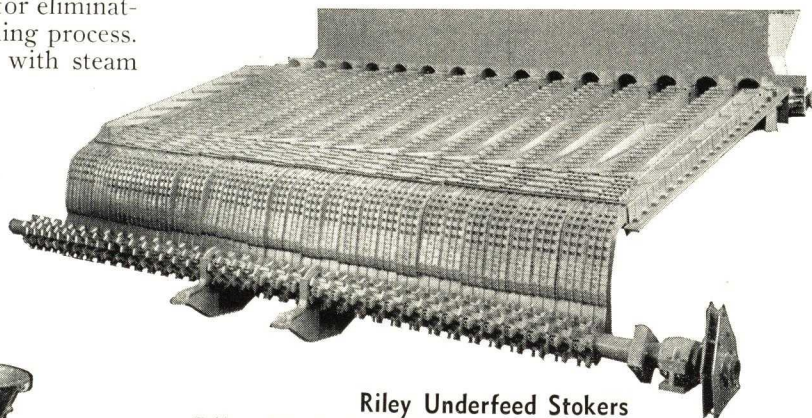
Riley Pulverized Coal Burners are designed to operate with maximum economy and to give stable ignition over wide load ranges. Burners are made in sizes to burn

as high as twelve thousand pounds of coal per hour and with a load operating range of from ten to one. Burners are all designed for short flame operation. Send for Catalogue SW-92.



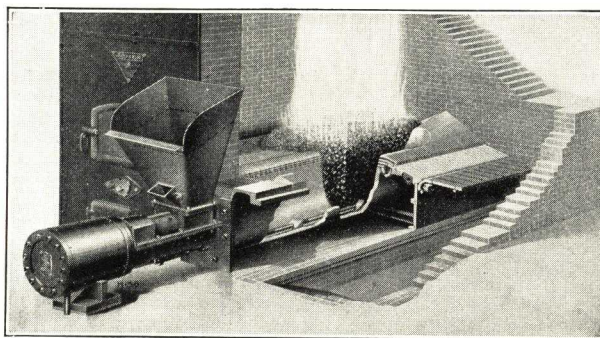
Harrington Traveling Grate Stokers

Harrington Stokers are of the forced draft traveling grate type which burn successfully and efficiently a wide range of fuels including all of the fine sizes of anthracite, lignite, mid-western coals, coke breeze, river dredgings and bituminous coals. They are built in sizes for installation under boilers from 200 hp. up to the largest built. Send for Catalogue SW-88.



Riley Underfeed Stokers

Riley Underfeed Stokers are multiple retort underfeed stokers and may be equipped with either rocker dump or clinker grinder. They are particularly adapted for installation in plants where high capacities and efficiencies are desired. They are built in sizes suitable for installation under boilers from 200 hp. to the largest built. Send for Catalogue SW-115.



Jones Side Dump Stokers

Jones Side Dump Stokers are of the single or double retort type with dump plates at the sides. They are readily installed under existing boilers as but slight excavation is required. They are built in sizes for boilers from 50 hp. to 400 hp. They may be either steam or mechanically operated. Send for Catalogue SW-90.

SEMET-SOLVAY ENGINEERING CORPORATION

40 Rector Street, NEW YORK, N. Y.

Engineers and Constructors

By-Product Coke Oven Plants.
By-Product Recovery Apparatus.
Light Oil, Benzol and Phenol Recovery Equipment.
Ammonia Equipment.
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Waste Heat Boilers.
Tar Burning Ovens and Systems.
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Blue Gas Plants.

Carburetor Water Gas Plants.
Fuel Preparation and Handling Systems.
Mechanical Generators for Water Gas.
Ignition Arch Process for Carbureting Water Gas with Heavy Oil.
Gas Washers and Condensers.
Cooling Coils.
De-Emulsifiers for Dehydrating Tar.
Welded Pipe and Fittings.
Valves and Blast Gates.

Services

General Plant Layout—Engineering—Investigations—Reports.

By-Product Equipment

Semet-Solvay By-Product Coke Oven Equipment, Gas Plant Equipment and apparatus for the recovery, handling and treatment of all products obtained from coal are well known. We invite inquiries for the installation of Semet-Solvay equipment, and for the engineering services of our organization.

Semet-Solvay Ignition Arch Process for Carbureting with Heavy Oil

This process, developed to take advantage of the economies made possible by the availability of low cost oil, has been accepted by the water gas industry for its unequalled efficiency. Courses of fire brick in the carburetor are eliminated.

Two refractory arches are constructed at right angles to each other, at the top of the carburetor. They ignite the blast gases which are thoroughly mixed in the angle connection with secondary air, and they maintain the ignition of this mixture. The combustion that takes place in the carbureting zone is complete. There is no carry-over of combustion in the superheater, due to the slow travel of gases through the open space below the arches.

During the up-run, oil in an evenly distributed fog is directed upward toward the arches counter-current to the downward travel of gas. Complete mixture of the oil fog and gas is accomplished without contact of the oil with the arches. Oil cracking and formation of fixed gas are completed in the combustion chamber.

During the back-run, oil may be sprayed into the generator directly on the fire. When this is done the carbon in the oil and carbon from "reforming" are deposited on the fuel bed, thus diminishing the amount of solid fuel necessary per M.C.F. This arrangement provides flexibility whereby the operator may use solid fuel and oil in whatever proportions are most economical. Also, it gives greater leeway in obtaining gases of certain required analyses to meet special conditions.

The Semet-Solvay Ignition Arch Process for Heavy Oil is adaptable to coke, anthracite or to a mixture of bituminous coal and coke as generator fuels.

Semet-Solvay Welded Piping

Made and recommended for use in handling gas, air, water, steam, pulverized substances, oil and chemicals. It is being manufactured of steel having various commercial analyses, and also of a number of special purpose alloys.

We build square, oblong and oval pipe, as well as round, and are equipped to produce piping products true to specification that will meet almost any need.

Pipe can be made with plain ends for butt welding or with beveled ends for a V-weld, in accordance with individual requirements, in thicknesses suited to practically all conditions of service. We invite opportunities to suggest dimensions most suitable for particular requirements.

Whenever permissible, our layouts provide for fabricating straight lengths of pipe with branches, elbows and reducers

into single pieces ready for erection. This eliminates large numbers of field joints and keeps the cost of assembly and erection at the lowest obtainable point.

Semet-Solvay All Iron Gate Valves

Made for a variety of low pressure duties in sizes from 4 in. to 36 in., inclusive. A generous stock of each size is maintained for immediate delivery. The powerful wedging mechanism on Semet-Solvay Gate Valves is built to provide complete seating of the discs before the wedging starts.

Semet-Solvay Steam Jacketed, Self-Clinkering, Automatic Grate Generator

The Semet-Solvay Automatic Generator for water gas machines adapts the highly efficient Koller Grate to this equipment. Semet-Solvay is sole licensee for the United States under the Koller Patents.

The generator is of double shell design, the inner shell being of extra heavy metal, to eliminate the need for fire brick lining. The water jacket serves not only for cooling, but also for producing steam at about 10 lbs. pressure. The steam is taken up by a drum attached to the shell. The water cooling prevents the formation of side wall clinker.

Ash removal is continuous. Each hopper has two doors, hydraulically operated and so interconnected that only one can be open at a time. All moving parts are enclosed in a gas-tight, cast iron casing.

Semet-Solvay Koller Type Gas Producer

The Semet-Solvay Koller Type Gas Producer was originally developed in Europe to gasify low grade, small sized fuels economically. The SEMET-SOLVAY ENGINEERING CORPORATION is exclusively licensed in the United States under the Koller Patents.

This producer can be furnished with either water seal or dry bottom. The water sealed producer is adapted for use with moderate blast pressures. When high blast pressures or high gas pressures are required, the dry bottom type is better suited.

Continuous Fueling—Easy, leak-proof charging of the fuel to the magazine is provided by a charging hopper equipped with a safety device which prevents the opening of the bell when fuel is admitted to the hopper and locks the door when the bell is down for the passage of fuel into the magazine. Possible explosions during fueling periods are prevented. This hopper is used only for coke or anthracite coal.

When bituminous coal is used, the producer is equipped with an agitator and a mechanical coal feed. The fuel is fed to the generator, continuously and evenly over the fuel bed. With continuous agitation, the fuel bed is kept at uniform porosity.

Semet-Solvay Cooling Coils

Meet the specifications of the gas, by-product recovery, chemical and brewery plants. They are furnished completely shop built, ready to mount. Tubes may be of any specified material to withstand the effects of salt or brackish water. We furnish on request a catalog which gives full details of design, construction and operation.

THE TITUSVILLE IRON WORKS COMPANY

(DIVISION OF STRUTHERS WELLS-TITUSVILLE CORPORATION)

Boilers, Tanks and Steel Plate Work

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FIRETUBE STEEL BOILERS for Power and Heating.

TUBELESS STEEL WATER HEATERS.

Also manufacturers of Steel Plate Work, including Tanks, Smokestacks, etc.; Boiler Fronts and Castings, Grates, etc.

Facilities

Our shop is one of the largest and best equipped boiler manufacturing plants in the country. It is provided with the latest improved machinery, including hydraulic and pneumatic riveting machines, also best hydraulic flanging equipment. Electric overhead cranes insure careful and rapid handling of material. Our welding machines are of the most modern improved types and the operators, experts, who do nothing but welding daily. All seams of Titusville welded boilers are welded inside and outside by electric arc-machines.

A large stock of plates and tubes is carried and shipment can be made with reasonable promptness. Also a large stock of completed Tico and Acme riveted firebox boilers and a large stock of welded firebox heating boilers ready for immediate shipment.

A.S.M.E. Code

Our boilers are made in strict accordance with the latest boiler code of the American Society of Mechanical Engineers, or can be made to conform to local requirements.

Inspection and Test

All boilers are thoroughly inspected during their entire construction by a representative of the Hartford Steam Boiler Inspection and Insurance Company, who is in continual

attendance at our works. Boilers are tested to required hydrostatic pressure, made absolutely tight and stamped "ASME." All workmanship and material are guaranteed first class in every respect. The insurance company's test certificate is furnished free of charge, if desired.

Working Pressures

All boilers when used for high pressure or power service are made for 100 to 150 lb. working pressure, A.S.M.E. Code, and are tested with hydrostatic pressure 50% in excess of the working pressure. Standard heating boilers are made for 15 lb. working pressure A.S.M.E. Code and tested to 60 lb. hydrostatic pressure.

Steam Radiation Ratings

Firebox and horizontal tubular heating boilers are all rated on basis of 14 sq. ft. of radiation per square foot of fire surface.

In determining the size of a boiler, take the actual amount of cast iron radiation or equivalent, plus the piping, and add about 5 to 10% and select a boiler with the next highest rating.

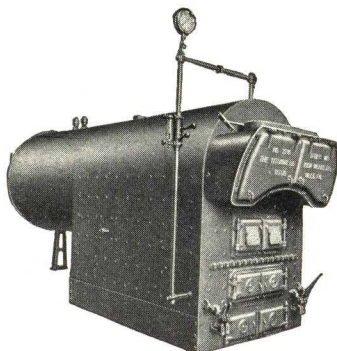
Equipment

All our boilers are provided with complete castings as illustrated below. Stationary grates are standard equipment on all horizontal tubular boilers. Shaking grates are standard with all firebox boilers.

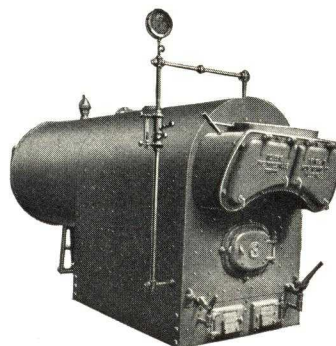
Special grates can be furnished on all types when desired.

Catalogues

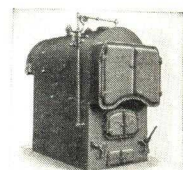
New catalogues and pamphlets on welded firebox boilers and other types gladly sent on request.



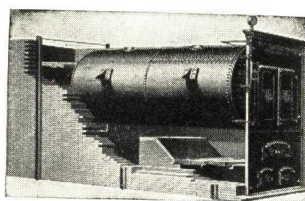
Series "WS"—Welded Smokeless Boiler



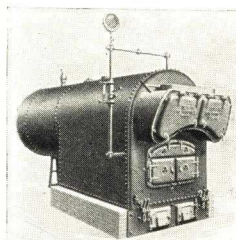
Series "W"—Welded Boiler



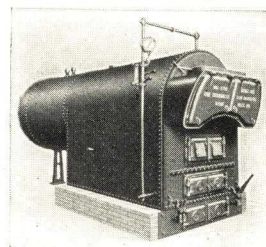
Series "SR"—Compact Type Welded Boiler



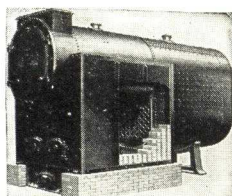
Horizontal Tubular Boiler for Power and Heating



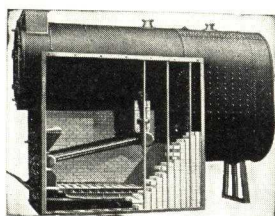
Series "RS"—Smokeless Riveted Firebox Boiler



Series "R"—Riveted Firebox Boiler



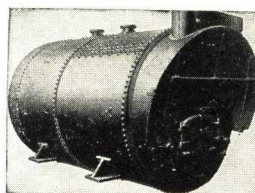
Perfection Return Tubular Portable Boiler



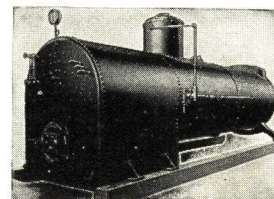
Perfection Smokeless Return Tubular Portable Boiler



Vertical Boiler



Scotch Boiler



Locomotive Boiler



Jacketed Tubeless Water Heater

THE GENERAL SPECIALTY CO., INC.

Manufacturers of Boiler Cleaning Machines

71 Carroll Street, BUFFALO, N. Y.

"DEMON" BOILER TUBE CLEANERS FOR WATER TUBE BOILERS

"Demon" Tube Cleaners are power driven (water or air) and are made for both straight and curved tube boilers.

Where most cleaners bore out only the top soft portion of scale and glide over the hard portion, "Demon" Cleaners bite their way through to clean metal and remove every particle, including the hard tough inner layer.

"Demon" Cleaners have a fixed, snug-fitting cutter head and the rotating shaft to which the head is attached has 10 to 24 times the twisting power of an ordinary turbine cleaner. The full force of the water or air strikes three rotary pistons of wide area extending lengthwise of the cleaner.

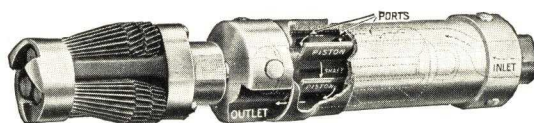
Water Driven, Straight Tube Type—For 3½ and 4-in. tubes, driven by 100 to 150 lb. water pressure. This type consists of a motor and a cutter head, as illustrated. The head has three rows of cutters arranged on eccentric shafts to per-

The DEMON
TUBE CLEANER
For Water Tube
Boilers



The third yields slightly to permit the cleaner to pass the bends freely.

Air Driven Type—For 3½ and 4-in. tubes, driven by air (not steam) at 60 to 90 lb. pressure. This cleaner consists of a motor and cutter head and a drill head and universal joint. The cutter head of this model is of the flexible type. The main shaft rests on Timken roller bearings, so that the motor is easy-running, durable and capable of great speed. The rotary



Drill Head for
Heavy Scale

pistons are not permitted to rub on the cylinder wall. Thus wear, either on edges of the pistons or on the wall of the cylinder, is impossible. In efficiency and in durability the air driven model is a regular "demon."



Universal Joint

mit cutter adjustment. This is called the *non-yielding head* because the cutters, when set and locked, remain rigid until reset. No patch of scale, however hard, can make them contract. This head, driven by the powerful "Demon" motor, will dig its way stubbornly through the toughest scale and clean the tube right down to the metal.

Water Driven, Curved Tube Type—For 3, 3¼ and 4-in. curved tubes, 100 to 150 lb. water pressure. This cleaner consists of a motor, cutter head and universal joint and also a drill head, as shown. The cutter head follows closely the design of the *non-yielding head* of the straight tube type.

The bends in the tubes make it impracticable to have all the cutter shafts rigidly fixed, so two of them only are non-yielding.

Hose for "Demon" Cleaners—For our water driven cleaners we recommend 1½-in. 4-ply wire-wound water hose. For our air driven cleaners we recommend 1-in. 3-ply moulded and braided air hose, plain.

To accommodate customers, we carry hose in stock. Air hose can be furnished in any length desired. Water hose is furnished only in the following lengths: 25, 30, 35 and 50 ft.

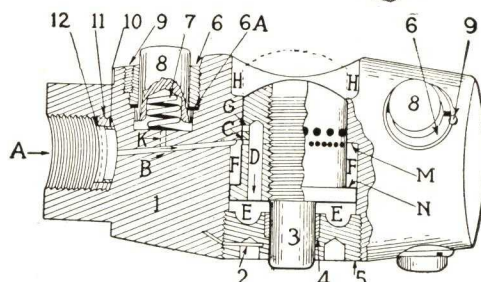
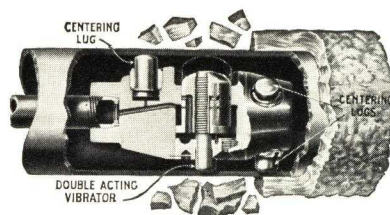
"TORPEDO" BOILER TUBE CLEANERS FOR FIRE TUBE BOILERS

"Torpedo" Tube Cleaners deliver a light blow of short stroke with great frequency that effectively loosens scale without injury to the tube. A double acting vibrator with a ⅜-in. stroke taps the tube wall 11,000 times per minute. The tubes of a return tubular, marine or locomotive boiler can be cleaned in 2 to 4 hours.

Operated by air or steam at from 60 to 90 lb. An air compressor with a capacity of 7 to 10 cu. ft. will furnish sufficient power.

The "Torpedo" is made in 2, 2½, 3, 3½, 4, 4½, 5 and 6-in. sizes. The shipping weight is 11 to 18 lb., depending on the size.

The TORPEDO
TUBE CLEANER
For Fire Tube
Boilers



Sectional View of "Torpedo"

1—body; 2—cap lock pin; 3—vibrator; 4—cap bushing; 5—cap; 6—centering lug nut; 6A—centering lug washer; 7—centering lug spring; 8—centering lug; 9—centering lug nut lock pin; 10—(with 11 and 12) screen

Note: In ordering, give the correct outside diameter of your tubes and state whether they are welded.

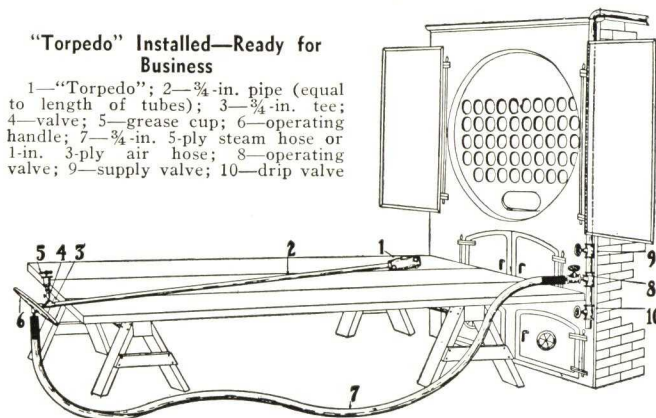
For welded tubes we furnish a special type "Torpedo," which differs from the standard type only in the way the centering lugs are held out. In the standard type, the lugs are forced out by springs. In the welded tube type they are pressed outward by the air or steam with which the cleaner is operated so they can more easily squeeze in when they pass over welds.

This "Torpedo" taps more lightly or stops operating entirely when it passes over a weld, because the vibrator is prevented from taking its full stroke by reason of the contracted diameter of the tube. As soon as the weld is passed it will automatically start again.

This is an ideal cleaner for welded tubes because it will clean them without opening up the welded joints.

"Torpedo" Installed—Ready for Business

1—"Torpedo"; 2—¾-in. pipe (equal to length of tubes); 3—¾-in. tee; 4—valve; 5—grease cup; 6—operating handle; 7—¾-in. 5-ply steam hose or 1-in. 3-ply air hose; 8—operating valve; 9—supply valve; 10—drip valve



VULCAN SOOT BLOWER CORPORATION

DU BOIS

PENNSYLVANIA

SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

Product

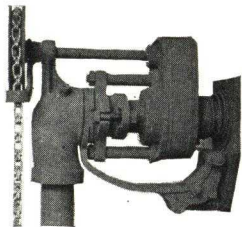
SOOT BLOWERS for All Types of Boilers, Superheaters, Economizers, Air Heaters and Oil Stills.

VULCAN SOOT BLOWERS

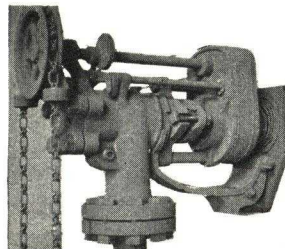
Vulcan Soot Blowers Effect Savings in Fuel and Operating Costs

Vulcan Soot Blowers reduce the time required for cleaning by 90% over hand lance methods resulting in reduced labor and steam expense and the further losses due to disruption of the normal operation of the boiler. Direct fuel savings of 4% to 8% also result due to the clean heating surfaces obtained by the use of Vulcan Soot Blowers.

Vulcan Soot Blowers increase the capacity of the boiler, decrease the draft loss and protect and save boiler walls, fans and tubes. Vulcan Soot Blowers eliminate the danger, dirt, confusion and labor turnover of hand cleaning methods and result in large, indirect savings in operation.



Vulcan Ratchet Head



Vulcan Valve-Operating-Head

A Type for Every Range and Design of Boiler

Vulcan Ratchet Head—Incorporates a step by step motion giving the effect of a stationary jet in a rotary element resulting in thorough cleaning with less use of steam and prevents careless operation whereby the element is revolved too fast for cleaning.

Vulcan Valve-Operating-Head—A single unit embodying the valve and rotating device which are synchronized to function by operating one chain, thereby saving steam, labor, repairs, trouble and confusion over the independently operated type. May be had with the Ratchet Operation or Gear Drive.

Distinctive and Vital Features

(1) Both types equipped with Flange or Union Outlet which decrease installation and maintenance costs.

(2) Both types have adjustable Under Arm Support which carries the weight of the head and piping independent of the element, at the same time permitting movement of the head and element in all directions. Practically eliminates element warpage.

(3) Extra long packing and accessibility for re-packing.

(4) Sweeps adjusted accurately at any time without dismantling the head.

(5) Heads may be set in virtually any position instead of a few set positions.

(6) Enclosed drive mechanism.

(7) No valve packing on Vulcan

Valve-Operating-Heads.

(8) Single chain at front of head avoids confusion in operation.

(9) Valve parts on Vulcan Valve-Operating-Heads can be readily inspected or replaced without dismantling or removing heads.

(10) Exceptionally low pressure drop through the heads.

(11) On Vulcan Valve-Operating-Heads the valve opens practically with the start of rotation of the element and closes instantly at the end of the sweep.

Bearings Improved

The VULCAN SOOT BLOWER CORPORATION has developed an Intimate Contact Bearing of new and scientific design made from a new heat resisting alloy called VULite, which has exceptionally long life and gives protection to the element, but at the same time provides economical first costs. The very satisfactory and reliable standard bearing and clamp has been improved.

Superior Element for Each Location

VULcrom elements are fabricated from a thick wall seamless steel tube, protected by a heavy integral deposit of pure chromium. Providing a high heat resisting element especially effective for all but the highest temperatures.

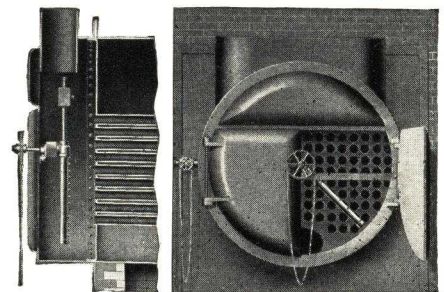
HyVULoy elements are used for the most severe locations. These elements are a thick wall seamless tube made from an alloy developed by the VULCAN SOOT BLOWER CORPORATION which give the highest heat resistance for boiler service, consistent with high strength and freedom from brittleness and structural changes. Its heat resistance is further increased by a heavy integral deposit of pure chromium.

The nozzles for both types of elements are made from HyVULoy, which are securely welded in place.

Soot Blowers for Return Tubular Boilers

This type of blower consists of a revolving blower arm equipped with high velocity nozzles spaced to blow directly into each boiler tube as arm is rotated.

The construction eliminates the use of swinging joints or breaking steam connections to open doors. Each Model "M" is specially built for the boiler on which it is to be used.



Soot Blower for Return Tubular Boiler

CONSOLIDATED SAFETY VALVE DIVISION

CONSOLIDATED ASHCROFT HANCOCK COMPANY

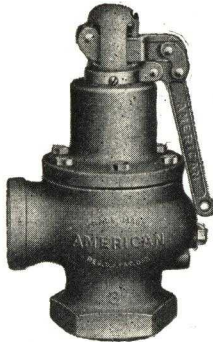
INCORPORATED

BRIDGEPORT, CONN.

ASHCROFT AMERICAN GAUGE DIVISION HANCOCK AND METROPOLITAN INJECTOR DIVISION
AMERICAN SCHAEFFER & BUDENBERG DIVISION HANCOCK VALVE DIVISION

Consolidated Safety Valves

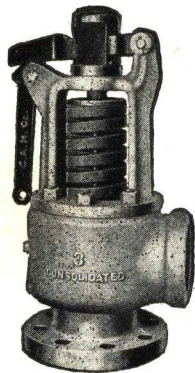
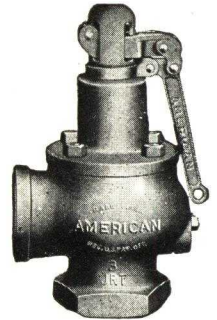
Iron body bronze mounted pop safety valve for stationary boilers, for pressures to 250 lb. Type 1405 with screwed inlet; Type 1407 with flanged inlet. Regularly furnished with bronze seat, but can be supplied with MMM seat and MMM feather. MMM is a high nickel alloy of exceptional strength and hardness. Sizes: 2, 2½, 3, 3½, 4 and 4½ in.



Consolidated Safety Valves

Iron pop safety valve for pressures to 250 lb., designed for fire tube boilers, standardized in relation to capacity in A.S.M.E. Boiler Code.

Type 1414, with screwed inlet; Type 1416 with flanged inlet. Regularly furnished with bronze seat but can be supplied with MMM seat. Sizes: 2, 2½, 3, 3½, 4, 4½ in.



Cast Steel Safety Valves

Type 1411 Iron Pop Safety Valve for stationary and marine boilers, for pressures to 250 lb. Seat bushing is MMM, a high nickel alloy of exceptional strength and hardness.

Type 1413 Cast Steel Pop Safety Valve for saturated and superheated steam pressures to 450 lb., with MMM seat bushing and feather. These valves are made in 1½, 2, 2½, 3, 3½, 4, 4½ and 6-in. sizes.



Oil Field Boiler Safety Valves

Type 1570 Oil Field Boiler Drum Safety Valve, with 2-in. screwed inlet, seat bushing and feather of MMM, a high nickel alloy of exceptional strength and hardness, top of malleable iron, for pressures to 400 lb. and 450° F.

Type 1572 Oil Field Boiler Superheater Valve of cast steel, with outside spring, with bushing and feather of MMM, for pressures to 400 lb. and 750° F.



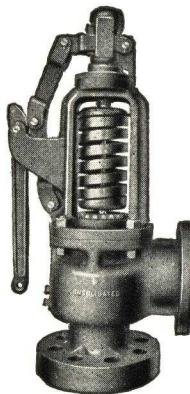
High Pressure Safety Valves

Type 1555 High Capacity Cast Steel Safety Valve with extended reinforced bushing for water tube boilers, exposed spring type for saturated or superheated steam pressures from 300 to 600 lb. and 825° F.

Type 1556 High Capacity Cast Steel Safety Valve for saturated or superheated steam pressures from 601 to 900 lb. and 825° F.

Type 1557 High Capacity Cast Steel Safety Valve for saturated or superheated steam pressures from 901 to 1500 lb.

Type 1558 High Capacity Cast Steel Safety Valve for saturated or superheated steam pressures from 1501 to 2000 lb.



Water Relief Valves

Standard bronze water relief valves for pressures to 250 lb., for use on tanks, pipe lines, etc.

Made with either female or male screwed inlet, with or without hand wheel.

Sizes: ½, ¾, 1, 1¼, 1½, 2, 2½ and 3 in.



Hydraulic Relief Valves

Type 1535 Hydraulic Relief Valve, all-bronze, for pressures to 5000 lb., with female screwed inlet and outlet. Sizes: ½, ¾, 1¼, 1½ and 2 in.

Type 1540 Hydraulic Relief Valve of semi-steel for pressures to 4000 lb., with flanged inlet and screwed outlet.



Portable Pop Safety Valves

Bronze portable pop safety valves for pressures up to 300 lb. Adaptable to portable boilers, tractors or similar equipment. Made to A.S.M.E. and various other codes or regulations. Type 1445, top outlet; Type 1451, side outlet.



Underwriters' Relief Valves

Underwriters' Iron Body Water Relief Valve, for pressures to 250 lb. Accepted by Inspection Department of Associated Factory Mutual Fire Insurance Companies, for use on standard Underwriter fire pumps. Sizes: 3, 3½, 4 and 5 in.



HENSZEY DE-CONCENTRATOR CO.

Continuous Blow-down, Meters, Heat Exchangers

WATERTOWN, WIS.

BRANCH OFFICES

BIRMINGHAM, ALA.
BOSTON, MASS.
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MIAMI, FLA.
MILWAUKEE, WIS.
NEW YORK, N. Y.
PHILADELPHIA, PA.
PITTSBURGH, PA.

Henszey Continuous Blow-down

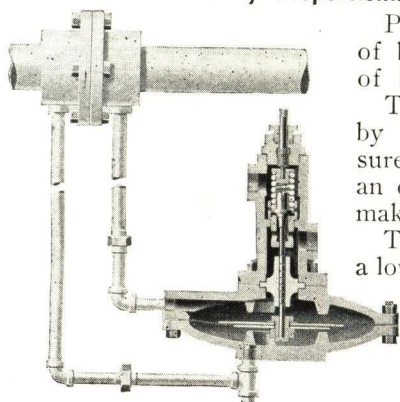
All types, Flash Chamber or Heat Exchangers. Insures clean boilers; clean steam; no priming.

Licensed under patents—

Babcock & Wilcox Co. No. 1,543,727
Roy O. Henszey No. 1,740,300
Roy O. Henszey No. 1,786,113

Maintain a predetermined boiler water concentration. Use the original and only system that automatically removes the impurities at the same rate at which they are being fed. Henszey Heat Exchangers transfer the heat of the blow-down immediately to the hot feed water, and to the make-up water.

Henszey Proportioning Valve



Henszey Proportioning Valve

Proportions the amount of blow-down to amount of feed or make-up.

The valve is operated by the differential pressure on the two sides of an orifice in the feed, or make-up line.

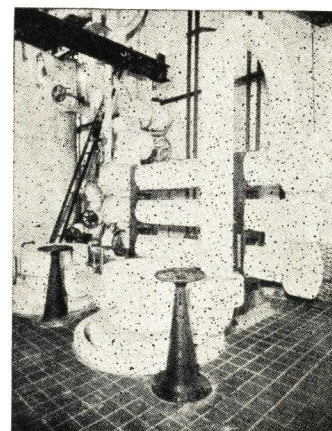
This valve operates on a low differential pressure, and therefore takes little power.

Can be used for proportioning two streams of any liquids.

Henszey Heat Exchangers

Henszey Heat Exchangers are made in all sizes, and for all pressures, and can be used for any heating or cooling purpose.

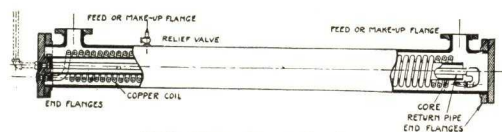
Engineering service cheerfully given without obligation.



Three-stage De-concentrator



U-Tube Heat Exchanger



Coil Type Heat Exchanger

Henszey Vortex Meter

For boiler feed, blow-down, dirty liquids, oil, etc.

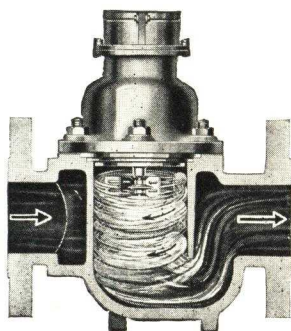
Liquid enters the measuring chamber of the meter tangentially, forming a vortex. The revolutions of the vortex are transmitted to a register by a rotor in the measuring chamber.

The Henszey Meter goes right in the pipe line. It will accurately measure the pulsating discharge of a recip-

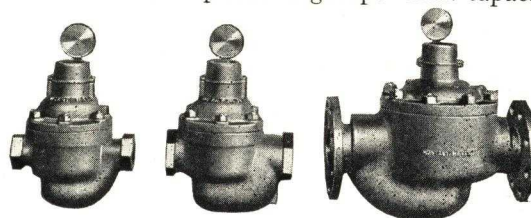
rocating pump. The measuring chamber is self-cleaning.

Guaranteed 99% accurate.

Made in all sizes up to 600 gal. per min. capacity.



Henszey Meter



Typical Henszey Meters

J. E. LONERGAN CO.

Manufacturers of Steam and Gas Engine and Boiler Specialties
219 Race Street, PHILADELPHIA, PA.

Products

POP SAFETY VALVES; RELIEF VALVES; PRESSURE GAUGES; AMMONIA GAUGES; HYDRAULIC GAUGES; WATER GAUGES; CHIME WHISTLES.

Also Plain Whistles and Whistle Valves, Vacuum Gauges, Steam Gauge Syphons, Revolution Counters, Marine and Engine Room Clocks, Lubricators and oiling devices.

Also manufacturers of Sight Feed Oil Cups, Cylinder Sight Feed Lubricators, Multiple Oilers, Cylinder Oil Pumps, Grease Cups and Oil Level Gauges.

Pop Safety Valves

Types "WT" and "WRT"—Built in accordance with A.S.M.E. code. Absolute lifting leverage—positive opening—gradual closing—minimum

blowdown. Can be disassembled without disconnecting escape pipe—outside adjustment—ball joints at spring steps—body and bonnet gray iron—steel stem—bronze seat and disc—alloy steel spring—guaranteed. Type "WT" is primarily designed for water tube boilers but is suitable for all types of boilers. Sizes, 2, 2½, 3, 3½, 4 and 4½ ins. Type "WRT" is for fire or return tubular boilers. Sizes, 2, 2½, 3, 3½, 4 and 4½ ins. Pressures, up to 300 lbs.

Type "WTES"—All steel body pop safety valve, exposed spring for use in connection with superheated steam and high pressure, solid nickel alloy seat, disc and ring. Sizes, 2, 2½, 3, 3½, 4 and 4½ ins.

Models "KDP" and "ODP"—Dust and fool-proof all bronze pop

safety valve. A sealed valve that is meddler, dust and fool-proof—conforming to A.S.M.E. code and all state laws in agreement with this. Dust cap, integral part of lift and enclosing adjustments cannot be removed without breaking seal of king bolt.

Sizes over 2 in. have compound lifting lever. Stem movement, straight line, pull and thrust.

"ODP," with side outlet, in sizes from ½ to 4 ins.; "KDP," with top outlet, in sizes from ½ to 3 ins.

Relief Valves

Model "H" "Underwriter" Type Water Relief Valve—Iron body, bronze mounted. Hand wheel regulates

Ask for Catalogue of "The Lonergan Line"

300 specialties for power plants

Lonergan



Type "WT"



Model "HRV"



Model "WTES"



Model "H"



Model "KDP"

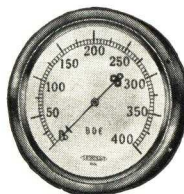
opening pressure. Good for working pressures up to 300 lbs. Recommended for use on pumps, elevators, pipe lines, water works, etc.

Model "HRV" Hydraulic Relief Valve—Especially designed for pressures from 400 to 10,000 lbs. Outlet connection in base casting so that in regrinding valve seat, outlet piping does not have to be disconnected. Made in brass, iron and cast steel also.

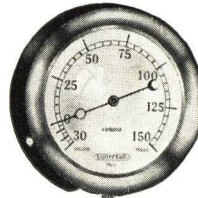
Pressure Gauges

For steam, water, air or vacuum. Pressure gauges graduated to any pressure not exceeding 1000 lbs. Vacuum gauges graduated to 30 ins.

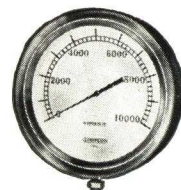
Type "BOE" Gauge—Will outlast the apparatus to which it is connected. Built in a cast bronze case and flare ring—not spun brass—hence will not dent or distort with rough handling, thereby destroying its accuracy. Made for all fluids or gases; heavy seamless drawn bourdon tube. Graduated to any pressure from 15 to 1000 lbs. Dial sizes from 5 to 12 ins.



Pressure Gauge



Ammonia Gauge



Hydraulic Gauge

Ammonia Gauges

Model "SAG"—Graduation 30-in. vacuum and 150 or 300-lb. pressure. Tube of tool steel, threaded and sweated into connections. Movements of monel metal.

Hydraulic Gauges

Model "GH"—Graduations 1000 to 30,000 lbs. Tubes of bar tool steel turned, drilled and formed, threaded and sweated into connections.

Model "GHB"—With maximum hand and resetting device.

Water Gauges

Model "QC"—Can be closed from safe distance to prevent scalding fireman if glass breaks.

Model "USN"—For marine work, automatic ball valve, double safety guard against scalding fireman.

Model "AC"—Closes automatically when glass breaks; automatic valve with renewable seat and quick closing thread.

Model "EH"—Plain gauge with wood or iron wheels.

Chime Whistles

Model "WV"—Sizes, 8, 10 and 12 ins. are equipped with compound balance valve, as it is very difficult to open an ordinary valve for these large sizes when used on high steam pressure. Bells of solid cast bronze and not built up with a web inside of a lap-welded tube. Flanged connections furnished at an extra charge.

Recommended for marine and stationary work, fire alarms, etc.



Model "QC"

ESTABLISHED 1914

NATIONAL CO., INC.

Manufacturers of Mechanical Engineering Specialties

Jackson, Abbott and Sherman Streets, MALDEN, MASS.

SALES ENGINEERING REPRESENTATIVES IN ALL PRINCIPAL CITIES

Products

NATIONAL WATER COLUMN ILLUMINATORS:

Type B for low pressure columns.

Type L for high pressure flat gauge glass insulations.

NATIONAL CELL-DOOR HARDWARE.

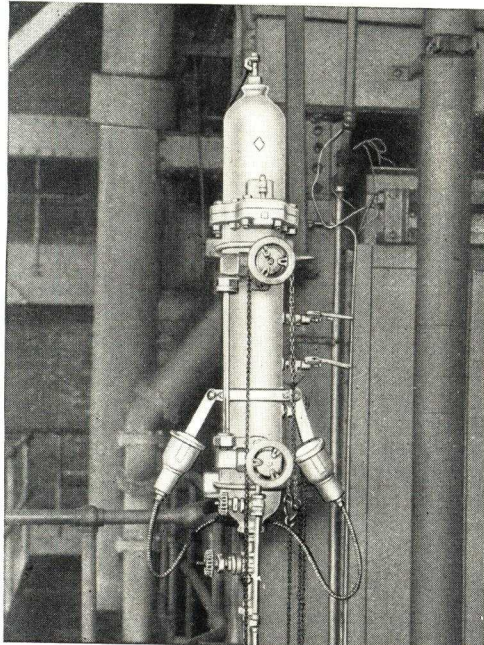
NATIONAL BLUEPRINT RACKS.

PRESTO BLUEPRINT HOLDERS.



National Water Column Illuminators

Are highly specialized products, embodying the basic features of meniscus reflection by controlled illumination. For ten years their use has been regarded as standard practice in the foremost engineering offices. They successfully meet the severe requirements of power station work and thousands of applications have proved their effectiveness and reliability.

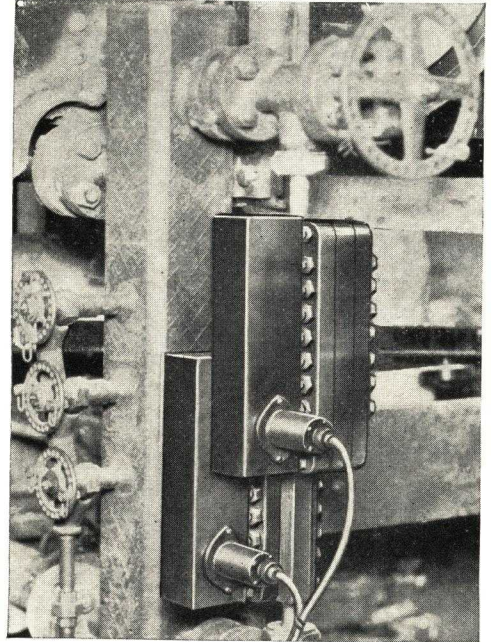


Not Merely Sources of Light

National Water Column Illuminators are a complete optical system designed in such a way that the surface of the water stands out as a sharply defined spot of light. The illumination is powerful and accurately controlled, and stray light is reduced to a minimum. Repeated tests have proved the ability of these Illuminators to make gauges easily and accurately readable under adverse conditions.

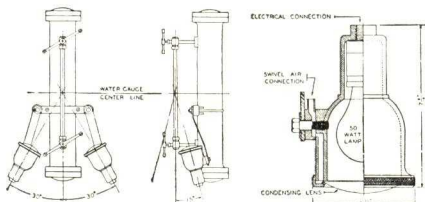
Fundamental Principle

Both Illuminators employ the same fundamental principle. Light is directed upwards at such an angle that total reflection takes place at the surface of the water. The surface of the water, acting as a mirror, thus directs the full brilliancy of the light beam down toward the operator's eyes. As the remainder of the light continues upward, unseen, the gauge itself is but feebly illuminated.

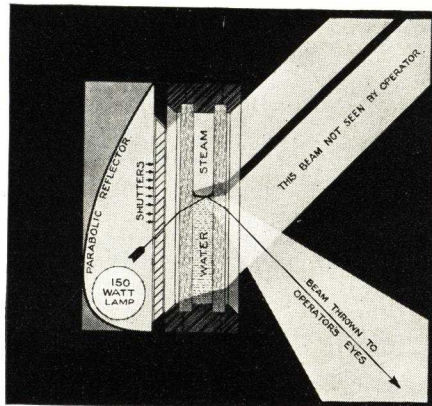


Type B Illuminator

For low pressure tubular gauges. Made of heavy cast aluminum, completely enclosed, equipped with heat resisting condensing lenses with provision for cleaning ashes and dust by compressed air through small orifices around each lens mount which are connected to a single swivel air connection on housing. Assembly is bolted directly to water column by cast aluminum yoke and U-bolt, supplied to customer's specifications.



Mounting Details, Type B Illuminator

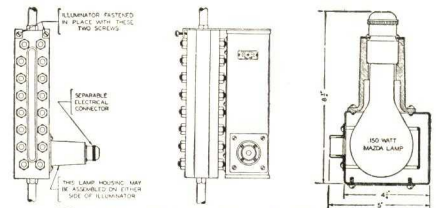


Schematic Drawing of a Type L Illuminator and Flat Gauge Shown in Section

Note that main beam from Illuminator (at the left) passes upward and through the gauge. As it is directed away from the operator's eyes, it is invisible. However, a portion of this beam strikes the water surface, and is reflected downward toward the operator's eyes. It is this second beam that produced the bright spot of light at the water surface.

Type L Illuminator

For high pressure gauges. Attached directly by means of single clamp. Polished stainless steel reflector of parabolic form directs rays of standard 150 watt light through gauge. Stray light eliminated by assembly of masking shutters. Complete assembly in heavy pressed-steel housing. Can be removed or mounted in a moment without tools. Furnished with detachable electrical connection. On multiple section flat gauges one Type L Illuminator is used per section. Built only to specifications because of wide variation of construction details of flat gauges.



Mounting Details, Type L Illuminator

National Cell-door Hardware

For switching and bus compartment doors in power and sub-stations.

A full line of corner braces and hangers for all types of transite and fireproof cell doors, has been developed over a period of years. Send for particulars and prices.

National Blueprint Racks and Presto Holders

Used the country over in offices and on construction jobs. These neat, efficient Racks and Presto Holders permit convenient filing of blueprints and large drawings in constant use. One rack and six holders will accommodate 500 prints or drawings. Blue prints are easily inserted or withdrawn.

THE RELIANCE GAUGE COLUMN COMPANY

Low and High Water Alarms for Boilers—Accessories

5914 Carnegie Avenue, CLEVELAND, OHIO

Service

Reliance Engineers will assist with any boiler water level alarm problem.

Reliance

TRADE MARK
EST. 1870 U.S. PAT. 1917

Literature

Descriptive literature sent promptly on request.

RELIANCE WATER COLUMNS AND ACCESSORIES

Water Columns

Safety Water Column—High or low alarms or combined high and low alarms.

Combined alarm (See Fig. 2) is for working pressures to 250 lbs. Hydraulically tested to 400 lbs. High grade castings, alarm valves of special nickel bronze with cone valve discs of chrome alloy steel—hardened, ground, lapped. Monel metal floats. Mechanism is simple, positive, frictionless, all above water.

Signal by whistle, electric alarm or both.

Junior Water Column—For boilers

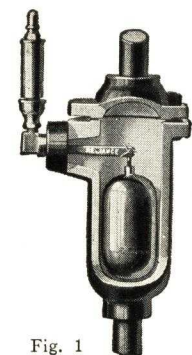


Fig. 1

where gages are tapped into boiler shell or section. Whistle signal for low water. For 200 lbs. pressure, will operate as low as 5 lbs. Electric switch for pressures from 50 lbs. to vacuum, if desired. (Fig. 1.)

Gauge Cocks

Standard—For working pressures to 450 lbs.



Fig. 3



Fig. 4



Fig. 5

Renewable monel metal seats and chrome cone valves that screw in and out, for easy maintenance.

Positive alignment. Body of heavy forged steel with chrome seats and discs. Strong, non-corrosive monel metal spring assures perfect valve operation. Sizes $\frac{1}{2}$ and $\frac{3}{4}$ in. (Fig. 3.)

High Pressure—For pressures to 2000 lbs. Heavy forged steel with chrome seats and discs. Easily renewable without removing cock from column. Seats and discs made by special process giving remarkable resistance to steam and heat. Operated by two chains from floor. (Fig. 4.)

Weighted—Quick chain opening, weight closing. Position of weight easily adjusted. Renewable monel metal seat and copper disc. Body of high grade steam bronze. Pressures to 250 lbs. (Fig. 5.)

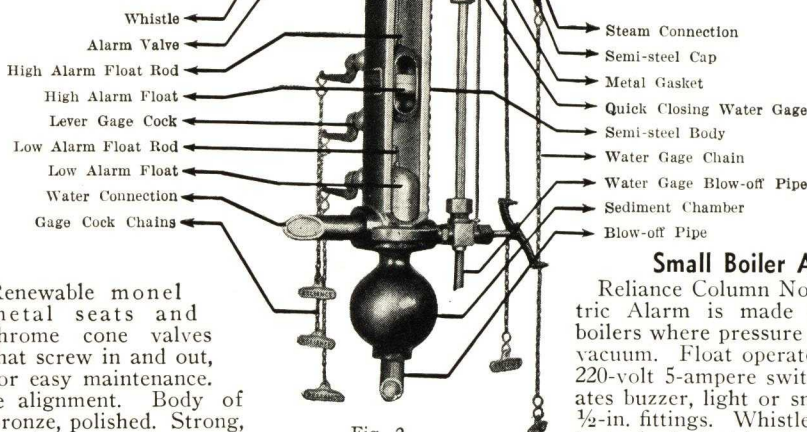


Fig. 2

Forged Steel Columns for High Pressures

For working pressures from 250 to 750 lbs. Joints made with metal gaskets. Valves have chrome alloy seats and discs, hardened and ground. Monel metal floats. Flanged or screwed steam and water connections and water gages. 450 and 750-lb. (Fig. 9) columns hydraulically tested 50% above working pressures. Every column given factory steam and water operation tests. Special columns for pressures to 2000 lbs.

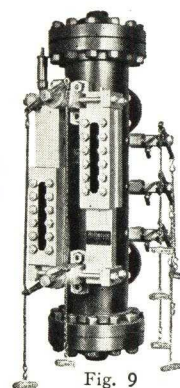


Fig. 9

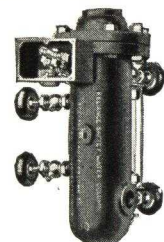


Fig. 10

Small Boiler Alarm (Fig. 10)

Reliance Column No. 00 with Reliance Electric Alarm is made for heating and other boilers where pressure is between 50 lbs. and a vacuum. Float operates 110-volt 10-ampere or 220-volt 5-ampere switch. Rings bell or operates buzzer, light or small motor. Tapped for $\frac{1}{2}$ -in. fittings. Whistle may be used instead of electric alarm.

Monel Metal Floats

Monel floats made by fusion process, internal reinforcement, super-strong, non-porous, non-corroding, heat-proof, unsinkable in service. Highly buoyant, instant reaction to water levels. Tested at double working pressures.

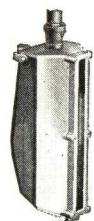


Fig. 11

Reliance Gage-Lite (Fig. 11)

Cast aluminum case, two-piece. Door acts as reflector. Face protected with clear $\frac{1}{4}$ -in. plate glass. Takes 50 or 60-watt lamp. Wide door for easy lamp replacement.

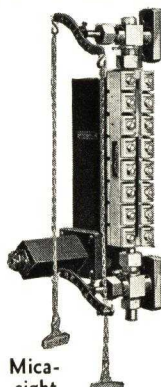
RELIANCE WATER GAGES

Chain Operated—Of fine quality. Flanged or screwed connections. Vertical (Fig. 6) or inclined. Prismatic glass if desired. Built throughout of steam bronze for pressures to 750 lbs.; for pressures up to 2000 lbs. gages are made of heavy forged steel, with removable processed chrome seats and valves, and monel stems. Extra deep stuffing boxes. All have quarter turn, quick action, chain pull shut-off. Micasight inserts instead of glass, on order.

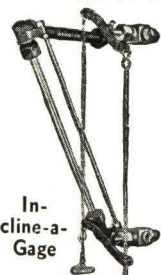
Micasight—Elimination of glass breakage by use of mica securely bolted into special housing with enclosed, lighted reflector behind it. Clear visibility. Made in types



Fig. 6



Micasight
Fig. 7



Incline-a-Gage
Fig. 8

for all pressures to 2000 lbs. and appropriate temperatures. Mica impervious to corrosive action of steam. Vertical or "Tilt-view" patterns. Any tubular glass gage easily converted to Micasight by replacing glass with Micasight insert. (Fig. 7.)

Inclined Water Gages—Tilt-view

Regular Reliance Water Gages fitted with screwed or flanged adaptors of standard or extra heavy pattern to match gages. Connections of high grade bronze. Top pipe connection of seamless steel tubing. Steel tie plate holds alignment. (Fig. 12.)

Incline-a-Gage—Inexpensive water gage adaptor to incline a vertical gage. Neat appearance. Special fittings which cannot blow off because of self-locking washers ahead of gaskets. (Fig. 8.)

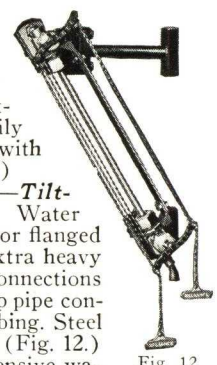


Fig. 12

AMERICAN ENGINEERING COMPANY

Manufacturers of Machinery of the Highest Quality Since 1857

Kensington Station, PHILADELPHIA, PA.

EXPORT OFFICE: 25 Broadway, NEW YORK, N. Y.

CANADA: Affiliated Engineering Corporations, Ltd., MONTREAL, QUE.

The Taylor Stoker

Application—The Taylor Stoker has been applied to all types of boilers (including marine boilers), to dryers, to heat treatment furnaces and metallurgical furnaces with complete success. It handles an unusually wide range of coals.

Design—The Taylor Stoker is of the multiple-retort inclined underfeed type and the first Taylor was the original stoker of this type. The main structure consists of trough-shaped "retorts" separated by rows of perforated, overlapping blocks or "tuyeres" which admit air. Bottoms of retorts are formed by secondary rams or pushers that distribute the coal throughout length of retort and force it inward and upward. As designed today, it can be built to any length on a steel structure, eliminating the necessity for any intermediate supports. Made in widths to fit any boiler. Can be operated by built-in steam turbine, steam engine, electric motor or electro-hydraulic drives.

Taylor Service—Combustion experts of wide experience are at your command and co-operate in every way in determining the correct solution of your combustion problem. A completely organized service department with centrally located service stations insures efficient operation after installation. Write for Taylor Stoker Catalogue.

Type H Taylor Stoker—Especially well adapted for installation under low-set boilers, where it is not practicable to raise boiler setting. Dump plate of steam dump stoker is actuated by a steam cylinder controlled by a convenient side located lever. Ashes are dumped by simply releasing plate. Can also be furnished with a rotary ash discharge instead of dump plate.

Type M Taylor Stoker—Similar to Type H except that feed and distribution of coal is accomplished by use of straight line drive. Made with either power ash dump or rotary ash discharge.

Type U Taylor Stoker—Designed for high capacities such as required in central station service. Has steel side plate construction the same as Type P stoker, with lower section of stoker structure resting on rollers and front section hinged to take care of expansion. The driving mechanism differs from that of shorter stokers, to provide for the extra pushers employed.

Hydraulic Type Taylor Stoker—Actuated by a Hele-Shaw low pressure rotary pump providing extreme flexibility of operation and an infinite number of speeds. Stoker can be operated indefinitely in "live banked" condition at fractional ratings and in a few minutes can pick up load and force boiler to ratings as high as 500 per cent or more. Rams are actuated by hydraulically operated plungers, eliminating crankshafts and gear boxes.

Type P Taylor Stoker—Furnished with Straight Line Drive as in Type M. Has steel girder supporting plates in place of cast iron, extending entire length of stoker from front wall to bottom of ash pit. Lateral expansion of stoker structure is taken care of in each individual retort. Water-cooled walls are advisable with crusher roll stokers.

"Lo-Hed" Monorail Electric Hoist



"The Electric Hoist that operates in the Minimum Headroom."

Capacities and Types—500 lbs. to 24,000 lbs. "Lo-Hed" is made in types

for every variety of service within the limits of its capacity. For alternating or direct current. Floor operated types: without trolley, plain trolley, hand geared trolley, and motor driven trolley; also motor driven trolley with cab control, for indoor or outdoor service.

Design—The ¼-ton hoist is fully enclosed in a pressed steel frame. Hoists of greater capacity are designed with drum and motor on opposite sides of, and parallel to, I-beam rail. This exclusive feature makes it possible to draw load block up between drum and motor into body of hoist and enables hoist to operate in the absolute minimum headroom. Lowering



brake ratchet and pawl and the gears are of steel, drop-forged; pinions and shafts are of high carbon steel; hoisting cable is of improved plow steel of highest tensile strength.

Efficiency—High mechanical efficiency is insured by use of Hyatt high duty roller bearings on ends of gear shafts and in trolley wheels; operation of all gears in an oil bath; lubrication of other bear-

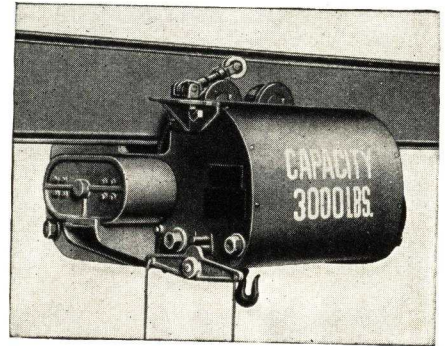
ings by means of Alemite high pressure system; and use of straight, spur gear drive and ball bearing motor.

Safety—All "Lo-Hed" hoists, except the ¼-ton, have either a four- or six-part load block, depending on their size—thus preventing spinning of load which occurs with two-part load blocks.

Accessibility—

By simply removing the outside metal covers all working parts of the "Lo-Hed" can be easily inspected or removed.

Quarter Ton "Lo-Hed"—A high speed electric hoist that weighs 200 lbs., pressed steel frame, push button control, ball bearings, oil bath lubrication, all working parts enclosed, gearing and shafts of drop-forged, heat-treated, chrome-manganese steel, drop-forged steel hook, heavy duty mechanical load brake, automatic electric brake—these are only a few of its many desirable features.



"Lo-Hed" Plain Trolley Hoist

CAPACITIES AND RATINGS—ALL CLASSES AND TYPES

Hoist	Capacity in pounds	Hoisting speed, feet per min.		No. of ropes	Height of lift, feet*		Minimum and maximum I-beam, inches
		A.C.	D.C.		Standard	Special	
A ½ (High speed)	1,000	20	20-40	4	20	25	hb6-12
A1	1,000	40	40-80	4	20	25	hb6-12
B1	2,000	20	20-40	4	20	25	hb6-12
B1 ½	2,000	35	35-70	4	20	f40	ic7-15
B2	3,000	25	25-50	4	20	f40	ic7-15
B3	4,000	20	18-36	4	20	f40	ic7-15
H2	6,000	12	12-24	6	15	g20	ic7-15
H3	4,000	25	25-50	4	20	f40	d10-20
H4	6,000	15	15-30	4	20	f40	d10-20
H5	8,000	15	15-30	4	20	f40	d10-20
H6	10,000	12	12-24	6	15	g20	d10-20
J3	12,000	10	10-20	6	15	g20	d10-20
J5	6,000	50	50-80	4	30	e15-24	e15-24
J6	10,000	25	25-40	4	30	e15-24	e15-24
J8	12,000	25	25-40	4	30	e15-24	e15-24
J10	16,000	15	15-24	4	30	e15-24	e15-24
J12	20,000	12	12-18	6	20	e15-24	e15-24
	24,000	10	10-16	6	20	e15-24	e15-24

(a) Speed varies between limits shown, depending on load.

(b) When a 12-in. I-beam is used, flange cannot exceed 5 in.

(c) When a 15-in. I-beam is used, flange cannot exceed 5½ in.

(d) When a 20-in. I-beam is used, flange cannot exceed 6¼ in.

(e) When a 24-in. I-beam is used, flange cannot exceed 9 in.

(f) These Special High Lift Hoists have 2 ropes.

(g) These Special High Lift Hoists have 3 ropes.

(h) Minimum I-beam for hand-gear or motor trolley is 7 in.

(i) Minimum I-beam for motor trolley is 8 in.

Class "A," "B," "H" and "J" hoists are built in the standard ratings

shown above. Special hoisting speeds can be furnished at added cost and an extension of the date of delivery.

Class "A" hoists are furnished with single-speed, rope-operated controller for either A.C. or D.C. Two-speed control can be furnished for D.C. at an extra cost. Class "B" and "H" hoists are furnished with single-speed, rope-operated controller for A.C., or three-speed, rope-operated controlled for D.C., unless otherwise specified.

Class "J" hoists are furnished with five-speed rope-operated controller for D.C. and six-speed for A.C. Lever operation is provided for cab control.

When required, Class "B," "H" and "J" hoists can also be furnished with D.C. dynamic lowering (foundry type) controller or can be arranged for remote control at an added cost. Also two-speed motor and control can be furnished on A.C.

*Higher lifts than those specified can be furnished by using long drums.

COMBUSTION ENGINEERING CORPORATION

200 Madison Avenue, NEW YORK, N. Y.

DISTRICT OFFICES

ATLANTA, GA.
BOSTON, MASS.
CHICAGO, ILL.
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CLEVELAND, OHIO
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SALT LAKE CITY, UTAH
SAN FRANCISCO, CALIF.

C-E Products

COMBUSTION ENGINEERING CORPORATION products include all types of stokers, pulverized fuel equipment, boilers and various steam plant auxiliaries. C-E installations range from small hand-fired units to the largest steam-generating units in the world, generating over 1,250,000 lb. of steam per hour. This organization, because of its broad experience, is in a unique position to analyze any fuel-burning or steam-generating problem and to suggest the equipment offering the best technical and practical solution.

Stokers

Type E Center Retort Underfeed Stoker—Applicable to boilers ranging from 150 to 600 hp. This stoker burns either coking or non-coking bituminous coals and various refuse fuels.

Type E Stoker-Unit—A small underfeed mechanical stoker applicable to boilers ranging from 400 to about 1500 sq. ft. of heating surface.

C-E Multiple Retort Underfeed Stoker—Designed for burning coking bituminous coals under boilers ranging from 500 hp. up.

Coxe Traveling Grate Stoker—Designed for burning low-grade anthracite coals and coke breeze. It is applicable to boiler units of all sizes.

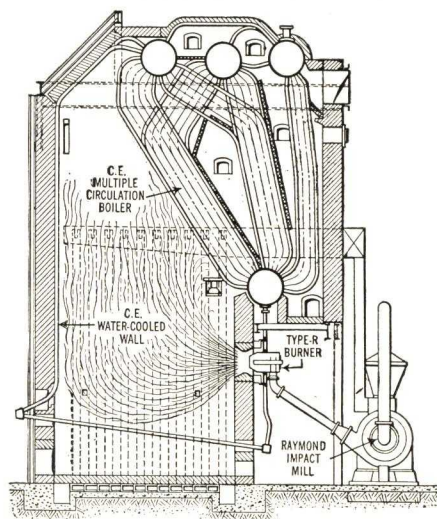
Green Chain Grate Stoker (Natural Draft Type)—Burns lignites and free-burning coals and may be installed under boilers up to 600 hp.

Green Chain Grate Stoker (Forced Draft Type)—Especially designed to burn mid-west bituminous coals, but it will also burn other low-grade fuels, including anthracite slush. It is applicable to boilers of all sizes.

Boilers

C-E Long-Drum Box-Header Boiler—This boiler is available in two types—H (horizontally baffled) and HC (cross baffled). Otherwise the construction of the two types is identical. Built in sizes ranging from 1000 to 12,000 sq. ft. of heating surface and for pressures up to 400 lb. per sq. in. Adapted to installation where space is limited.

C-E Cross-Drum Box-Header Boiler—This boiler is also available in two types—M (horizontally baffled) and MC (cross

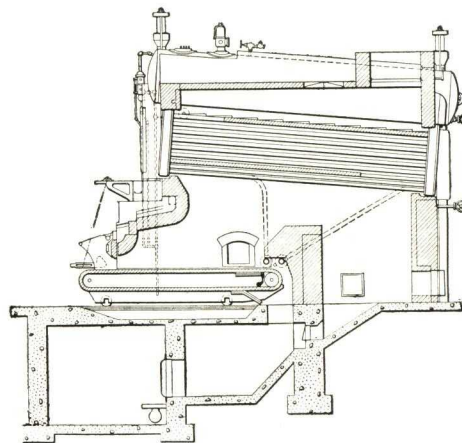


C-E Multiple Circulation Boiler Fired by the Lopulco Direct-Fired Pulverized Fuel System

baffled). Built in sizes ranging from 1000 to 15,000 sq. ft. of heating surface and for pressures up to 400 lb. per sq. in. Adapted to installation where space is limited.

C-E VM Type Boiler—Designed especially for low head-room conditions. Built in sizes ranging from 1500 to 5000 sq. ft. of heating surface and for any practical steam pressure.

C-E Sectional-Header Boiler—Built in sizes up to 60,000 sq. ft. of heating surface, and for pressures up to 1400 lb. per sq. in.



C-E Long-Drum Box-Header Boiler Fired by a Green Natural Draft Stoker

C-E Multiple Circulation Boiler (Bent-Tube)—Built in sizes ranging from 2000 to 26,000 sq. ft. of heating surface. This boiler is shown below at the left. Its design is unique in that half the tubes in the front tube bank connect into the front steam drum and the other half into the middle steam drum, thus equalizing the steam liberation in these drums.

C-E Premier Semi-Portable Boiler—Built in sizes from 200 to 2250 sq. ft. of heating surface and for pressures up to 150 lb. This boiler can be either hand or stoker fired.

C-E H.R.T. Boiler—Built in sizes ranging from 500 to 2500 sq. ft. of heating surface and for pressures up to 150 lb.

C-E Waste Heat Boilers—Built to meet special requirements.

Complete Steam Generating Units

COMBUSTION ENGINEERING CORPORATION manufactures complete, compact standard steam-generating units comprising boiler, furnace, fuel burning system and accessories. These standard units—the *Combustion Steam Generator* for medium size and large plants with capacities up to 450,000 lb. of steam per hr., and the *C-E Steam Generator Unit* for smaller plants with capacities from 8000 to 40,000 lb. of steam per hr., are adaptable for firing by pulverized fuel, oil or gas. Also complete special units comprising any desired combination of the company's standard line of boilers, stokers or pulverized-fuel systems, and auxiliaries. These complete units are sold under a single contract and a single performance guarantee.

Other C-E Products

Other products manufactured by COMBUSTION ENGINEERING CORPORATION are as follows: Lopulco Pulverized Fuel Systems (Storage and Direct-Fired Types); Lopulco Water Screen; Raymond Pulverizing Mills; C-E Bare-Tube Water-Cooled Furnace; C-E Air Preheaters; C-E Economizers; C-E Ash Conveyors; Ladd Boilers; C-E Ash Hopper; Special Furnaces for oil, gas or solid fuels; Quinn Oil Burners.

DETROIT STOKER COMPANY

GENERAL SALES AND ENGINEERING OFFICES
Third Floor General Motors Building, DETROIT, MICH.

MAIN OFFICE AND WORKS: MONROE, MICH.

DISTRICT OFFICES IN PRINCIPAL CITIES

DETROIT STOKER COMPANY OF CANADA, LIMITED

HEAD OFFICE: Canada Building, WINDSOR, ONT.

Built in London, Ontario, for Canadian Trade

TORONTO

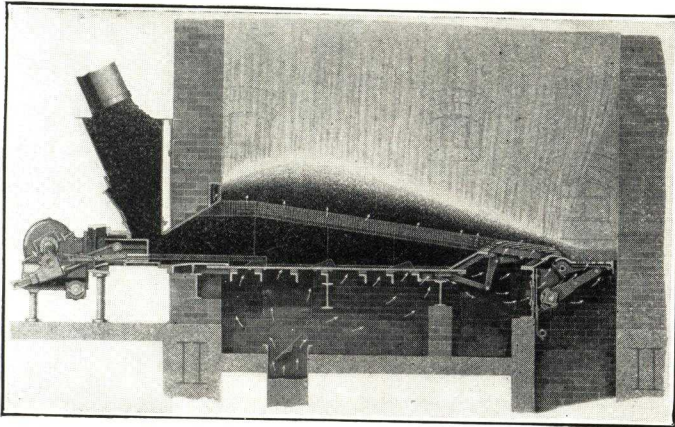
MONTREAL

Product and Service

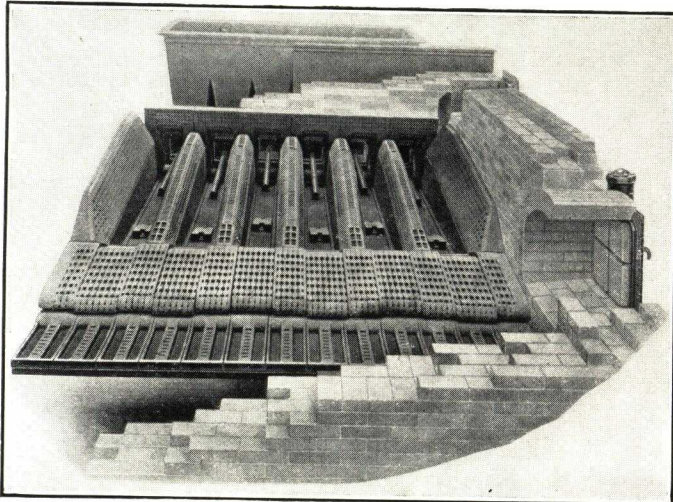
DETROIT STOKERS: built in various types and sizes to serve heating and power boilers from approximately 30 hp. upwards. They are also used for special industrial process heating. Bituminous coals, obtainable in all sections, are successfully burned. Many features embodied in the various designs represent over 30 years of experience in stoker engineering and manufacture.

Our Engineers will study your individual requirements. District Offices, located in principal cities, will furnish catalogues of any Detroit Stokers, or write DETROIT STOKER COMPANY, Detroit.

Detroit Multiple Retort Stokers



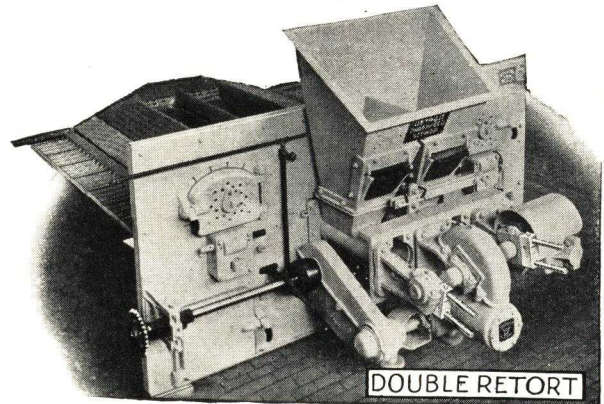
Detroit Multiple Retort Stoker (Side View)
(Fuel movement under complete mechanical control)



Detroit Multiple Retort Stoker (Rear View)
(Correct air distribution to entire fuel bed by air zoning)

For high capacities with large boilers. This stoker successfully burns a wide range of bituminous coals, without pulverizing or expensive preparation. Economical, because of many features: Independent control of the quantity of coal to each of the large, closely spaced retorts. Complete underfeed action with fuel movement adjusted to each retort, under mechanical control. Zoned air supplied in proper quantity at various points in the fuel travel. Heavily built mechanical drives. Detroit Stokers require little power for operation. Power dumps, available. Preheated air, water or air cooled walls may be used. Bulletin 158.

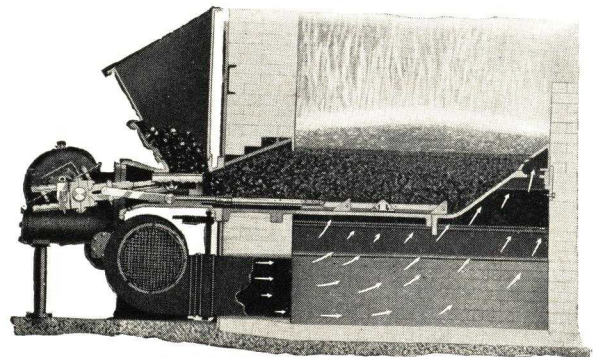
Detroit Double and Triple Retort Stokers



Detroit Double Retort Stoker

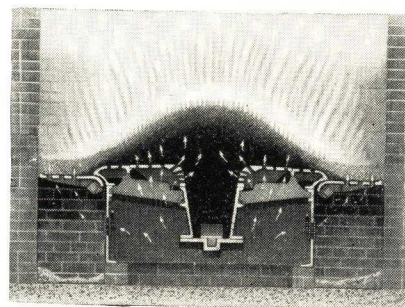
In these heavy duty, side-cleaning stokers, independent control of fuel feed and its distribution within the furnace are provided. The slicing action of the distribution bars makes the stoker continuously self-cleaning. They are economically applied to medium sized boilers already in service as no basement is required for ash removal. Bulletin 458.

Detroit Single Retort and Detroit UniStoker



Detroit UniStoker (Side View)
(Arrows indicate flow of air to fuel bed)

Detroit Single Retort and Detroit UniStokers for boilers from 100 to 300 hp. are mechanically driven, plunger feed, side cleaning. Large active grate area. Independent control of fuel feed and distribution. Bulletin 658.



Detroit LoStoker (Front Sectional View)
(Plunger feed, side cleaning, large active fuel bed)

Detroit LoStoker

For smaller heating or power boilers. Built in various sizes according to the furnace. Plunger feed, side cleaning automatically controlled from steam pressure, water temperature or room temperature. A great coal saver. Bulletin 358.

WESTINGHOUSE ELECTRIC & MFG. COMPANY

SOUTH PHILADELPHIA WORKS

P. O. Box 1522, PHILADELPHIA, PA.

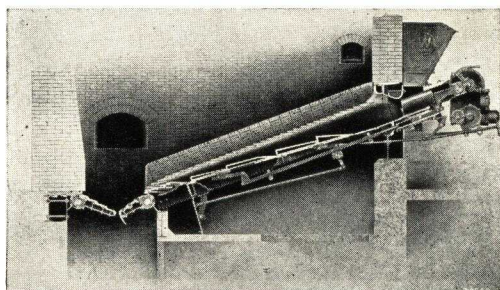
For Sales Offices, Service Repair Shops and Agent-Jobbers, see Our Catalogue on Switchboards, Motors, etc., as Listed in Manufacturers' Index

For Other Westinghouse Products, see Manufacturers' Index

Mechanical Stokers

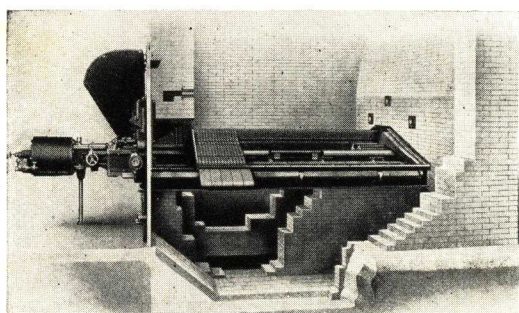
Large fuel savings are being effected by the application of present design Westinghouse stokers to boilers previously equipped with old designs of combustion apparatus. Over forty years' experience of Westinghouse in the design and manufacture of stoker apparatus assures a superior product.

Multiple Retort Underfeed Stokers—For application to boilers approximately 400 hp. and larger, the Multiple Retort Stoker is well suited. The Unit Retort type of construction in various lengths, fitted with dump grates, link grates or clinker grinders, provides ample combination to facilitate the selection of a stoker best suited for the particular boiler used.



Westinghouse Multiple Retort Underfeed Stoker with Dump Grate and Agitator

Single Retort Underfeed Stokers—For application to boilers approximately 400 hp. or smaller, the Single Retort Stoker is well suited. It is of the Center Retort type, with dump grates extending along the sidewalls of the boiler setting. This stoker is made in widths from 60 in. to 150 in. and in lengths from 6 ft. to 9 ft., to facilitate the selection of a stoker best suited to space and load requirements of the particular boiler used. The relatively low head room required, together with the elimination of the necessity for an ash removal basement, makes this type stoker very desirable for application to any boilers installed in limited space.



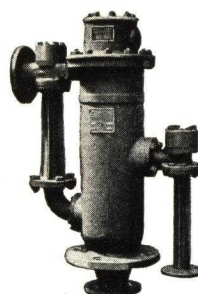
Sectional View of Westinghouse Single Retort Underfeed Stoker with New Undulating Grate Motion

Stoker Information Service

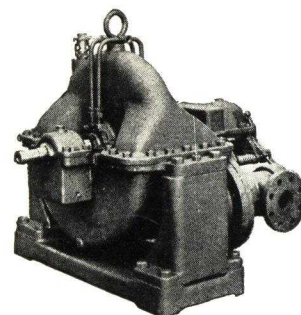
Westinghouse maintains in all principal cities east of the Mississippi complete stoker sales, engineering and service organizations, where there is information and data available to assist in solving all combustion problems. Inquiries are solicited. Communicate with our nearest office.

Steam Apparatus

This company builds a diversified line of steam turbines for both mechanical drive and electrical generation, together with a complete line of surface, jet and barometric condensers and their auxiliary equipment. Westinghouse apparatus offers the important advantages of compactness, simplicity of construction, low maintenance cost, high efficiency and minimum amount of attention.



Air Ejector with Jet Type Intermediate Condenser



Mechanical Drive Turbine

Heat Transfer Equipment

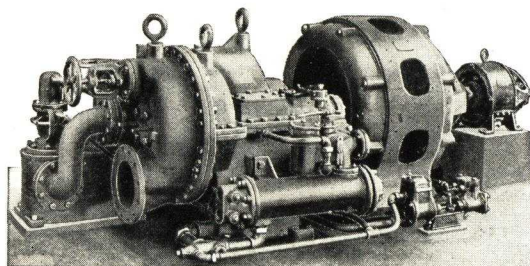


Heat Exchanger

Because each industry presents its own problem, Westinghouse heat exchangers are designed especially to meet specific conditions in each installation in order that greatest economy can be obtained.

Geared Turbine-Generator Units

These efficient non-condensing geared turbine-generator units range in capacities from 25 to 750 kw. for direct current and 30 to 1000 kw. for alternating current. They are particularly adaptable for applications requiring clean exhaust steam either for heating or for manufacturing processes.



300-Kw. Geared Turbine Generator Unit

Large Steam Turbine-Generator Units

Westinghouse large steam turbine-generators are furnished in capacities of 500 kw. and up in the following types: straight condensing, automatic bleeder, mixed pressure, low or high back pressure and non-condensing. Units are supplied to meet every demand of the market.



HOFFMAN COMBUSTION ENGINEERING CO.—DETROIT, MICH.



AN ACHIEVEMENT IN COMBUSTION

The HOFFMAN COMBUSTION ENGINEERING COMPANY, eleven years ago, pioneered the manufacture and distribution of the forced draft spreader type stoker, and has installed 95% of the stokers of this type now in use in the United States. HOFFMAN COMBUSTION ENGINEERING COMPANY was the first stoker manufacturer on record to extend written maintenance guarantees on stokers.



Every Hoffman FIRITE Stoker is sold under written efficiency, overload, and maintenance guarantees.



Efficiency guarantees extending over a term of years are valueless unless supported by a background of field experience gained through wide application and years of continuous service.



Experimental engineering and laboratory tests serve their purpose, but the experience of the user is the acid test.



A nation-wide sales and engineering service is at your disposal.

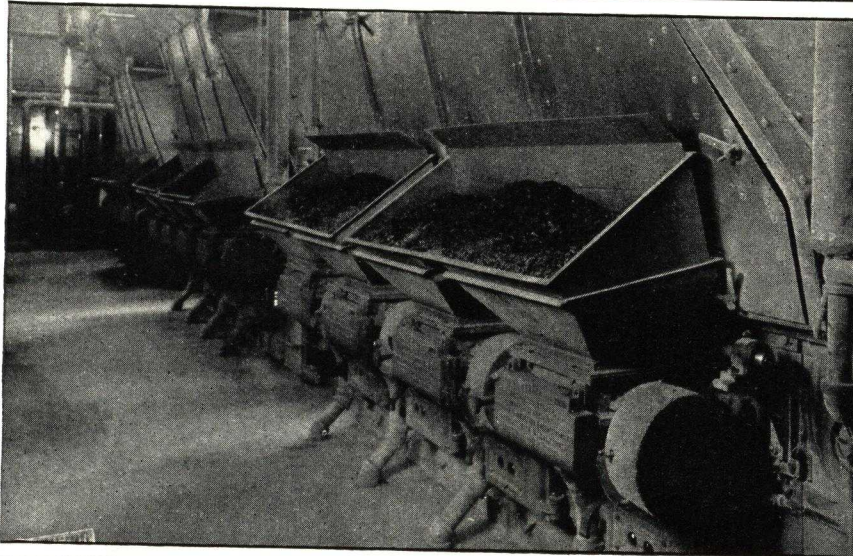


HOFFMAN COMBUSTION ENGINEERING CO.

GENERAL OFFICES • DETROIT, MICH.

For Branch Sales and Engineering Offices, See Inside Back Cover

FIRITE STOKERS



Hundreds of users of Hoffman FIRITE Stokers are daily experiencing practical

evidences of the superiority of this modern equipment. New sources of fuel supply have brought to them lower mine costs and lower freight rates. Higher efficiencies have reduced their coal tonnage. The ability to operate in old settings at high ratings without any undue loss in efficiency has obviated the purchase of new boilers. An almost total lack of maintenance has paid large dividends on the stoker investment. Low boiler outage, occasioned by repairs, together with the ability to hand fire the Hoffman FIRITE Stoker to full boiler capacity, permits continuous plant operation without standby units.

The owners and operators of FIRITE Stokers are universally enthusiastic and willing references. We will be glad to furnish you the names of people now using Hoffman FIRITE Stokers in your community, operating the same size and type of boilers, engaged in the same industry, or under similar load conditions, and through whom you can make your own independent investigation.

MEET MODERN POWER PLANT NEEDS

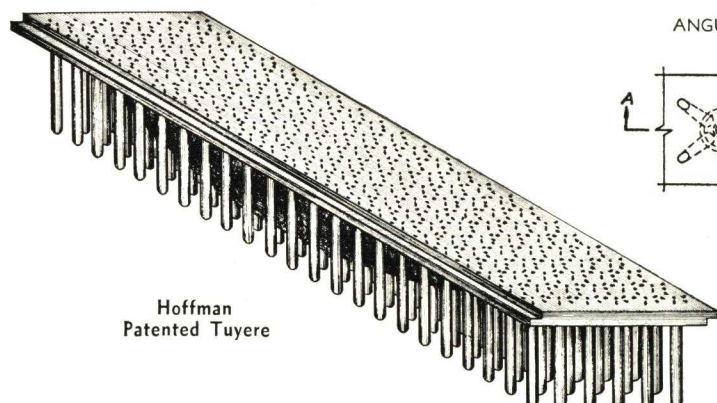
Many plants start their rehabilitation program by buying one or more FIRITE

Stokers, and then gradually add to these first purchases until they have completely replaced their previous stokers with FIRITE. A large percentage of this company's business, outside of new construction, is in replacing other types of stoker equipment; but no other stoker has ever replaced a FIRITE. The repeat business from FIRITE Stoker users is one hundred per cent, an unparalleled testimony of satisfied ownership.

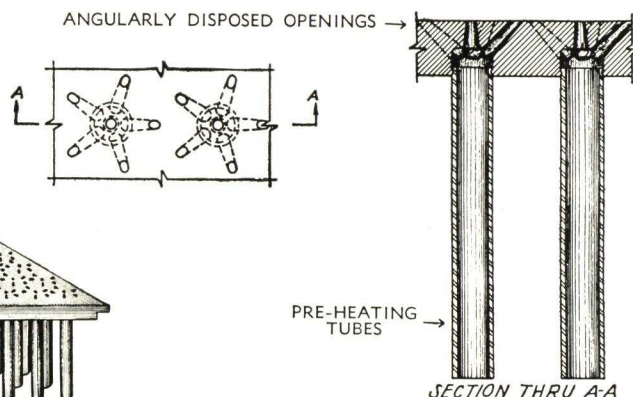
DESCRIPTION

The Hoffman FIRITE Stoker may be described as a combination of four functions: The Hoffman patented tuyere type grate on which the fuel bed is built. The Hoffman FIRITE coal feeding machines. The special forced draft assemblies, including the blower unit, primary air duct, secondary air manifold and ducts. And the control assembly, which may be either a simple steam pressure control, synchronizing the coal and air supply; or a complete combustion control system, in which damper regulation is incorporated.

PATENTED TUYERES PROVIDE FOR CROSS-CURRENTS OF AIR SUPPLY TO FUEL BED



Hoffman
Patented Tuyere

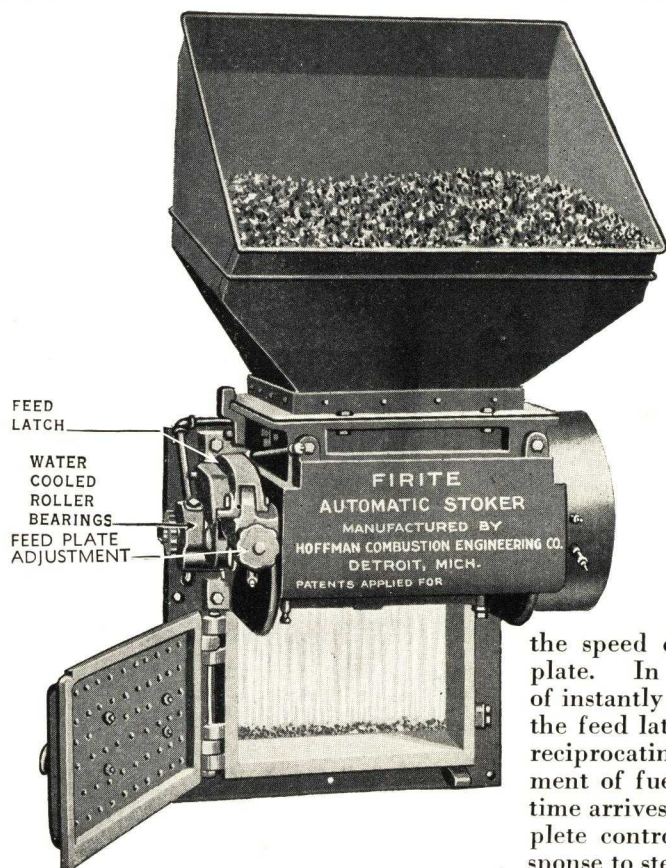


Extending beneath the fuel bed is the blast chamber. Air from the blower enters the chamber and, as required for combustion, is forced up through the steel tubes that extend downward from the tuyere plates. As the air passes through these tubes, it is pre-heated and thence delivered through the fuel bed via an infinite number of angularly disposed openings on the face of the tuyere plates, causing criss-crossing of air jets and promoting an even distribution of air over the entire grate area. So efficiently do these angular openings distribute

the air, it is physically impossible for them to blow holes through the fuel bed, thus effecting a great saving by establishing and furnishing the proper ratio of air introduction for complete combustion of the quantity of fuel being fired.

The area of these tuyere plate openings and the length of the pre-heating tubes are pre-determined for various classes of work. Made of special analysis gray iron castings, Hoffman patented tuyeres are practically indestructible, thus reducing maintenance and boiler outages for replacements and repairs.

COMPLETE CONTROL OF COMBUSTION RATE FOR FLUCTUATING LOAD DEMANDS



In conventional stokers, much waste is produced due to a direct and continuous connection between hopper and trough. The total contents therein usually amount to approximately a ton of coal which is in some stage of combustion and, therefore, causes sluggish action when peak is lowered or when an instant demand presents itself. With FIRITE Stokers, the fuel is supplied directly to the feed plate thence to the curved tray, from which it is picked up by the distributor blades and sprayed out onto the fuel bed.

So simple and timed is the regulation of the hopper-to-fire mechanism that only three to five minutes of fuel supply is in the process of combustion at any given time. A fire of 100% rating can be produced in approximately three minutes and the combustion rate can be cut off entirely in the same length of time. Stopping and starting of each distributor is automatically controlled, and an additional means for variation of feed is provided by simple adjustment of the feed plate which is handily done by screwing in or out of the hand wheel marked "Feed Plate Adjustment." This regulates the speed of the reciprocating motion that actuates the feed plate. In addition to the automatic control, a manual means of instantly discontinuing the introduction of fuel is provided by the feed latch (see illustration). Lifting of this latch stops the reciprocating motion of the feed plate, thus cutting off the movement of fuel from the hopper. This feature is used when the time arrives for cleaning the fire. Thus, with FIRITE Stokers, complete control of combustion rate is insured; there is quick response to steam demands; instant adjustment to fluctuating loads

STURDY CONSTRUCTION CONTRIBUTES TO TROUBLE-FREE OPERATION

The FIRITE Stoker is sturdily built to give years of day-in and day-out trouble-free service. Castings are precision-made in keeping with modern metallurgy and careful supervision. All parts subject to radiant heat are made of special analysis gray iron castings. Friction parts are of steel and semi-steel construction. The shafts are of ground high carbon steel and operate in roller bearings. Oversized

main bearings next to radiant heat are water-cooled. Full Alemite lubrication throughout is standard equipment. FIRITE coal feeding units are machined and assembled in line production, and each unit is subjected to complete mechanical test for clearances and operation at the plant prior to shipment.

TWO DISTRIBUTOR TYPES AVAILABLE ARE ADAPTABLE TO ALL CONDITIONS

FIRITE Stokers are made in many sizes with Type "A" and Type "C" Distributors. Both types are identical in design and construction. They differ

only in dimensions and capacities. In planning a FIRITE Stoker installation, the following is generally applicable:

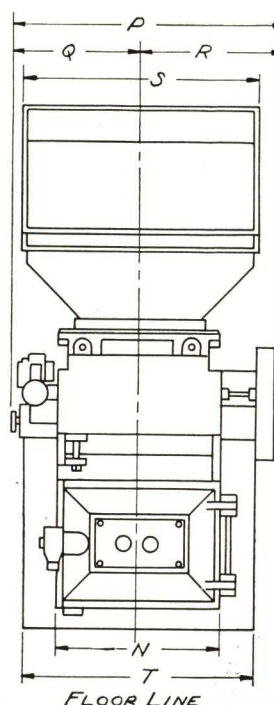
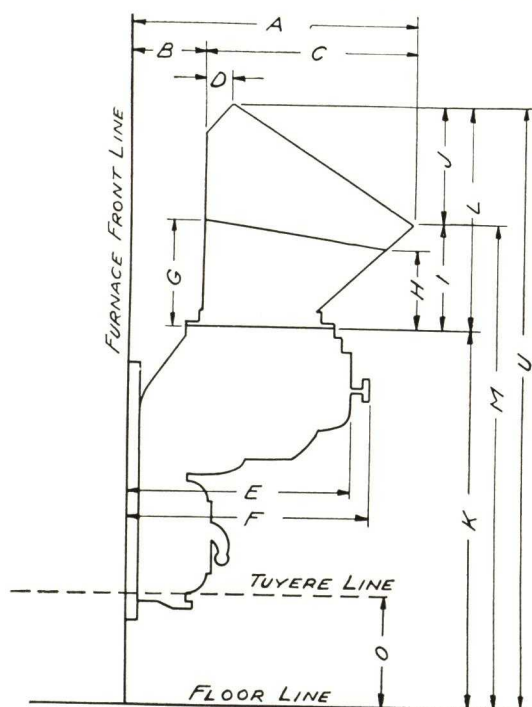
APPLICATION

For a furnace approximately 4 ft. wide, one Type "C" is used. For furnaces up to 5 ft., the walls are corbelled in to a width of 4 ft. For a furnace from 5 ft. to approximately 7½ ft., two Type "A" machines are used. Furnaces approximately 8 ft. wide take two Type "C" machines and those from 9 to 10½ ft. take three Type "A" machines. Furnaces approximately 11 ft. take three Type "C" machines and those approximately 12 ft. take either four Type "A" machines or three Type "C," depending upon the character of the fuel, furnace design and load requirements.

For distance from inside of front wall to bridge wall, dimensions vary to suit requirements for active grate area. Design is flexible, permitting grate sections being fitted into present furnace or brick work being fitted to the design. Or, a

compromise between the two conditions can be made. Furnaces equipped with one Type "C" machine take ½ h.p. stoker drive motor, 900 r.p.m. Jobs requiring two Type "A" machines take ¾ h.p. motor, and jobs requiring two Type "C" machines take 1 h.p. motor. Generally, add ½ h.p. to size of the motor for the addition of each machine.

Fans are full-housed SP type, usually direct-connected to fan motor or turbines, and except for the smaller units, fan speeds are around 1150 r.p.m. For power loads, fans are designed to deliver their full load capacity against 5-in. water gauge; for heating loads, the general practice is to use forced draft at low pressure beneath the grate, with supplementary air at high pressure through distributor plate above the grate.



DIMENSIONS OF TYPE "A" AND TYPE "C" DISTRIBUTORS

Type	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
"A"	32½	8½	24	3	26	28	14	10	12	14½	48½	26½	60½	19½	18	31¾	15¾	15¾	30½	26½	75
"C"	32½	8½	24	3	26	28	14	10	12	14½	48½	26½	60½	23¾	18	35½	17¾	17¾	34	30¾	75

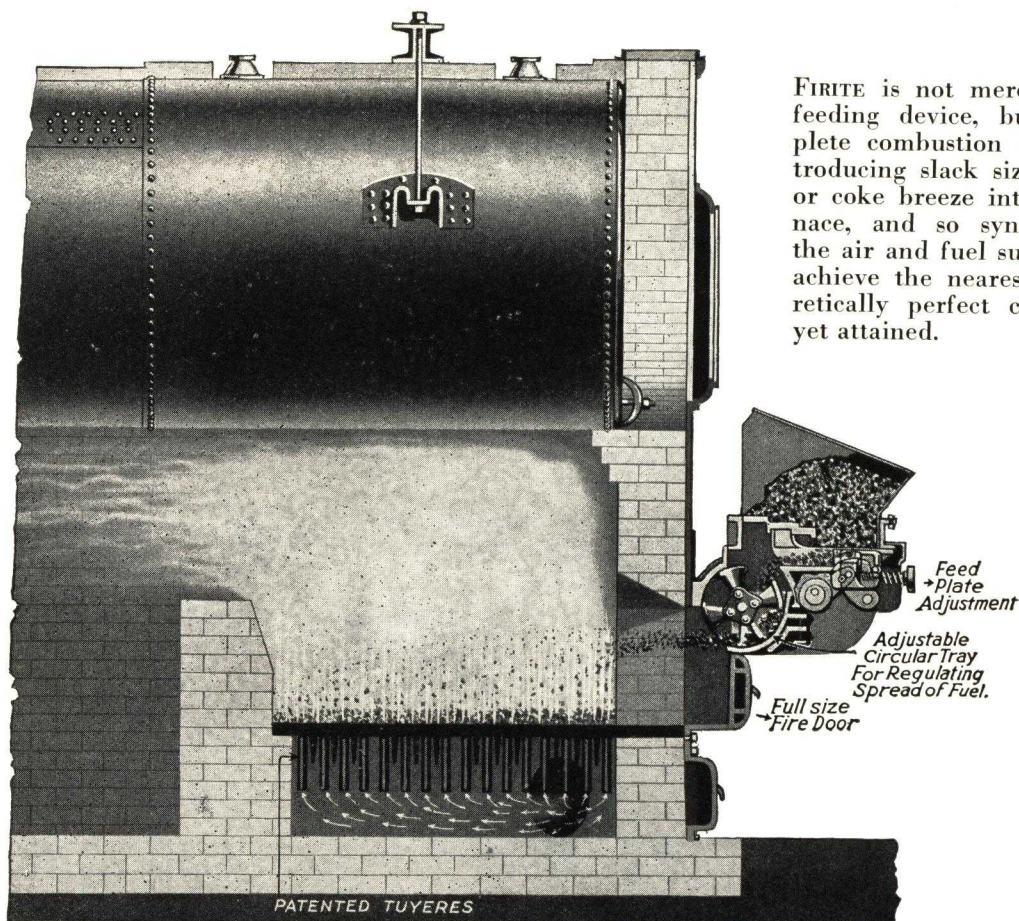
NOTE—All dimensions are in inches and are correct within plus or minus ¼-in.

||| SIMPLICITY OF OPERATION FEATURES THE FIRITE STOKER

From the sectional view below, it will be noted that the stoker body is mounted directly on the boiler front and becomes an integral part of the boiler. Directly beneath the coal hopper is the feed plate, which has a reciprocating motion that is imparted to it by means of a cam arrangement driven through enclosed steel cut gears. The coal that is on the feed plate is driven over the edge of the plate by the reciprocating motion and is deposited on the curved adjustable tray or throat-piece, whence it is picked up by the revolving distributor blades of special design and spread evenly and

continuously and lightly out over the entire grate area.

While the stoker is in operation, the steel distributor blades are held in position by centrifugal force and are, therefore, not rigid, so that in the event that an obstruction occurs, the blades will clear to the extent of 3.5 inches, thus eliminating any possibility of breakage. The running speed of the distributor blades remains constant and is determined, together with the position of the curved tray, for particular tuyere lengths and requires no further attention.



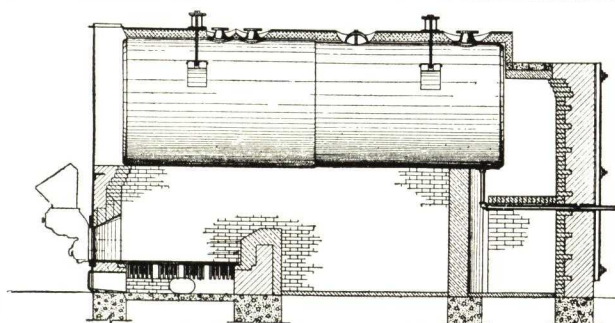
FIRITE is not merely a coal feeding device, but a complete combustion system introducing slack sizes of coal or coke breeze into the furnace, and so synchronizing the air and fuel supply as to achieve the nearest to theoretically perfect combustion yet attained.

||| LIGHT, CONTINUOUS FEED INSURES EVEN, ACTIVE FUEL BED

As the distributor blades revolve and pick up the fuel from the circular tray or throat-piece, the revolving motion of the blades, in conjunction with their special design, literally sprays the fuel continuously and lightly out over every square inch of the entire grate area and uniformly builds up an even, active, quickly responsive fuel bed. Aided by the even distribution of a proper proportion of pre-heated air through the patented tuyeres,

high rates of combustion are obtainable. There are no high and low spots of combustion; there is no arching of the fuel bed. The balanced heat condition constantly maintained throughout the entire combustion area contributes to longer life for tubes and refractories and provides for more uniform and effective rates of heat absorption by the water or fire tubes and shells.

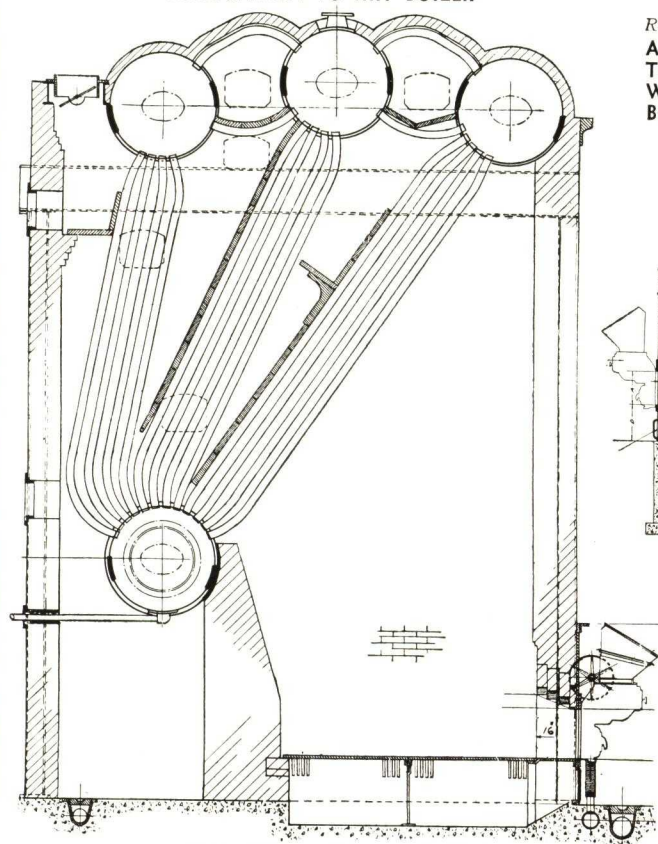
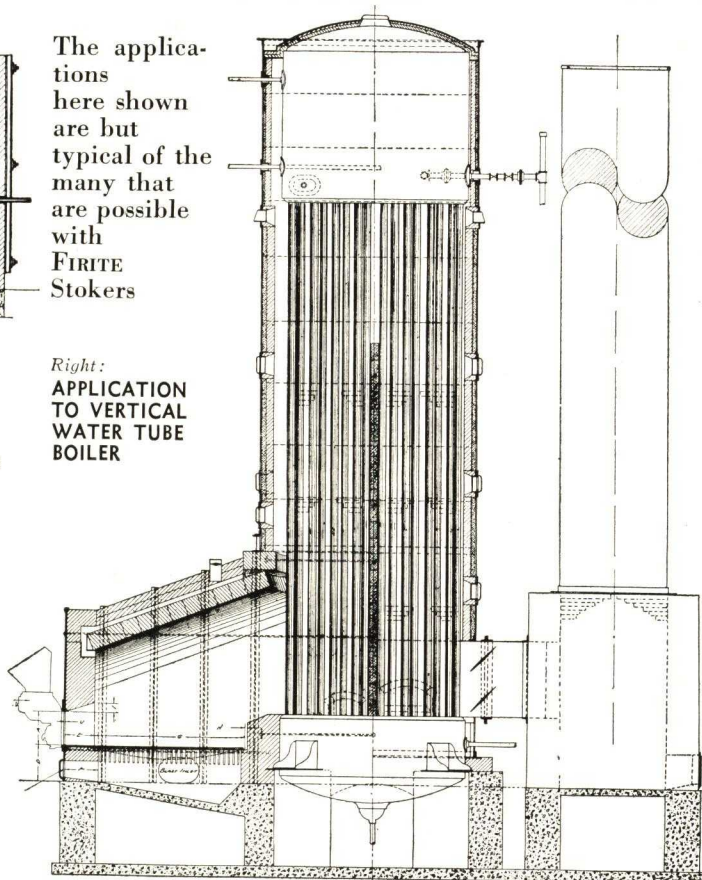
READILY APPLIED TO ALL TYPES OF BOILERS AND SETTINGS



APPLICATION TO HRT BOILER

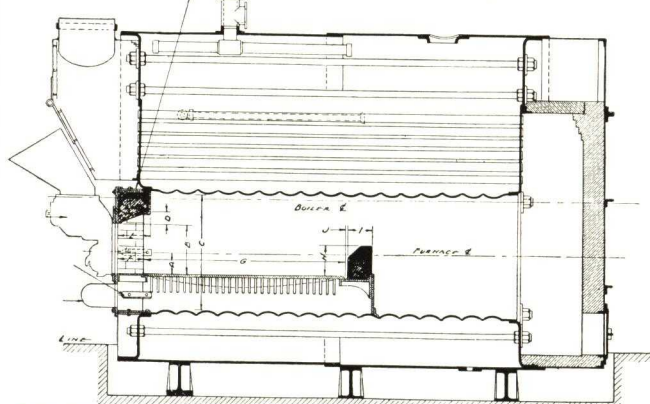
The applications here shown are but typical of the many that are possible with **FIRITE Stokers**

Right:
APPLICATION TO VERTICAL WATER TUBE BOILER



VERTICAL STERLING SETTING

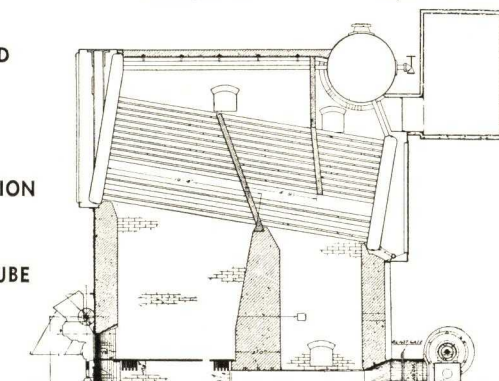
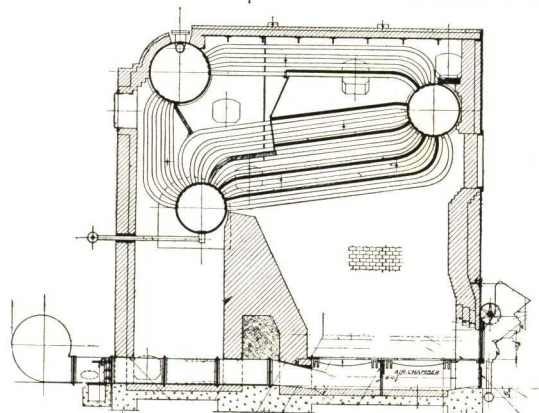
10 DRUM RING STOPS
COLLAR RING HELDS



APPLICATION TO 2-FURNACE DRYBACK SCOTCH MARINE BOILER

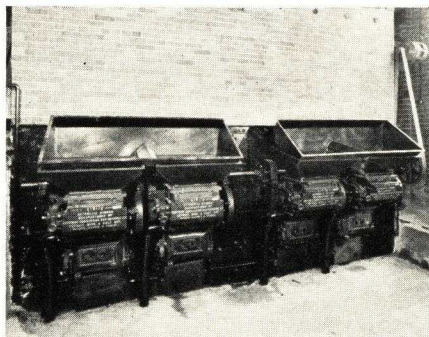
Above:
3 DRUM
LOW-HEAD
SETTING

Right:
APPLICATION
TO
CROSS
DRUM
WATER TUBE



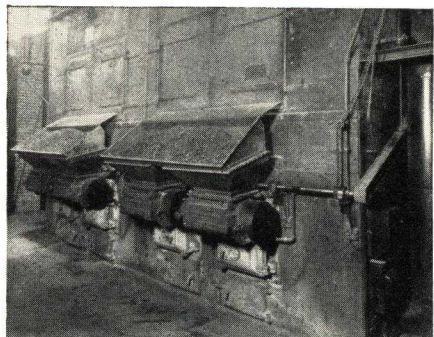
7 REASONS WHY FIRITE STOKERS DESERVE

REASON NO. 1 • Adaptable to All Types of Boilers—Wide Range of Capacities with High Efficiency



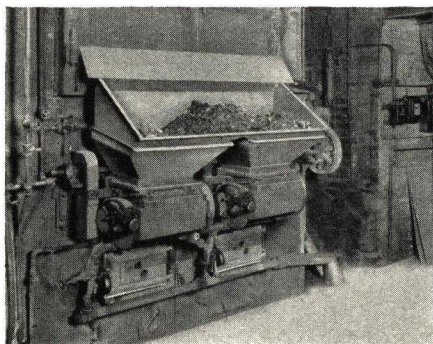
FIRITE Stokers are suitable for application to all types of boilers in sizes from approximately 60 to 1000 h.p. By the addition of standard units as needed increases in capacity and high efficiency are developed, allowing practically 70% of the equipment to be salvaged for larger boilers when and if desired. FIRITE Stokers are adaptable to other uses besides standard boiler settings, such as: existing low head-room jobs; plants with under-boilered capacity; Scotch Marine boilers without the use of Dutch oven; fire box boilers; brick set furnaces; ovens; calcining furnaces; kilns; gas benches; river boats; steam generators; coal burning ships with water tube boilers and with internally fired boilers; tugs, dredges, large steam shovels, etc.

REASON NO. 2 • Simple and Compact—Easily Installed in New and Existing Settings . . .



FIRITE Stokers are made in many sizes with Type "A" or Type "C" automatically controlled coal distributors. These distributors are alike in design and operation, but are of different capacities. This flexibility allows the adaptation of FIRITE Stokers singly, doubly, in multiples or in combinations to meet all furnace conditions, whether the settings be old or new. Simple and compact in design, FIRITE Stokers require a minimum amount of space and become an integral part of the boiler. No trough is used. Grate sections can be fitted into present furnaces, the brick work made to fit the design, or a compromise reached on the two conditions.

REASON NO. 3 • Maintenance Is Exceptionally Low . . .



The large, active tuyere areas obtainable with FIRITE Stokers permit continuous operation at high ratings without frequent cleaning and high maintenance costs, thus eliminating a major source of trouble and expense to the stoker user. All parts subject to radiant heat are made of special analysis gray iron castings and all friction parts are of steel and semi-steel construction. All rotating parts operate through roller bearings. Oversized main bearings next to radiant heat are water-cooled. Full Alemite lubrication is standard equipment. Naturally, such mechanical excellence is reflected in exceptionally low maintenance.

REASON NO. 4 • Burn Any Coal Mined, Also Coke Breeze—Carry Peak Loads at High Efficiencies—No Clinkering!

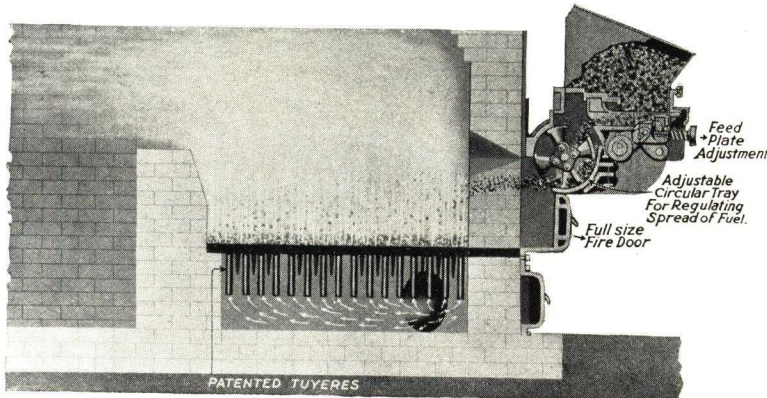
FROM A TYPICAL REPORT:

“ With Anthracite screenings, the system consumed 96%, leaving 4% or practically no unburned combustible. A study of test returns will show that practically all of the combustible contained in the ash from the car barn boiler was consumed by the FIRITE system, 1.6% remaining. My conclusions are . . . that any cheap fuel, no matter how fine or small, can be burned with economy and with a very high rate of efficiency. ”

No matter where your plant may be located, FIRITE Stokers will permit you to burn the coal mined nearest to you, because FIRITE Stokers will carry peak loads at high efficiencies with *any coal mined*, regardless of characteristics, from hard coal screenings and coke breeze to high or low volatile, high or low ash fusing temperature, without smoke or clinkering and its attendant troubles. You burn all your coal; you get all the steam you want, when you want it. It is not uncommon for FIRITE Stokers to obtain a 100% return on their investment within a year on savings in fuel alone.

YOUR MOST CAREFUL CONSIDERATION . . .

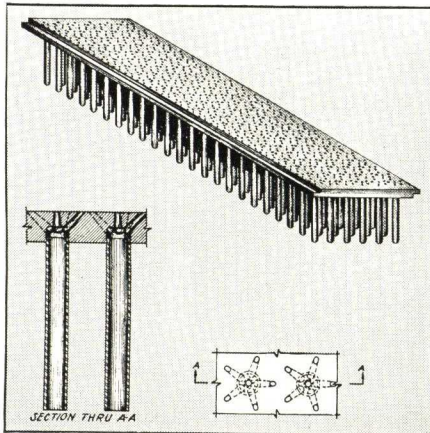
REASON NO. 5 • Fuel Fed Automatically Over Entire Grate Area—Can Also Be Hand Fired . . .



The FIRITE Stoker feed principle puts to practical use the ideal theoretical method of firing coal, namely, continuous and light. Coal is fed from the hopper by a feed plate into revolving steel distributor blades of special design which spread the fuel evenly, continuously and lightly over the entire grate area, thereby building up a quickly responsive, even, active fuel bed. Fine particles of fuel are burned in suspension; larger lumps are distributed over and burned on the tuyere plates. Adjustment of the fuel plate, for

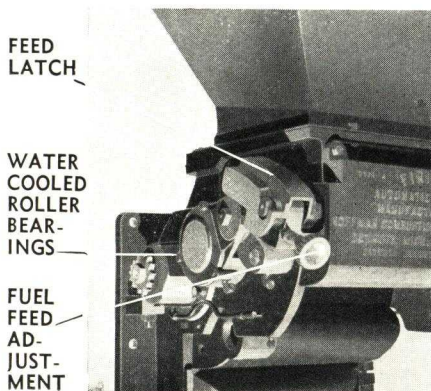
changing the rate of feed, is simply done by turning a convenient hand wheel. Lifting the feed latch instantly cuts off the fuel supply completely. Automatic control of the operation of each coal distributor in the battery is provided and operates on the smallest practical variations in steam pressure. A full-sized, unobstructed fire door is standard equipment with FIRITE Stokers for hand firing.

REASON NO. 6 • Patented Tuyeres Provide Uniform Rate of Air Flow According to Load . . .



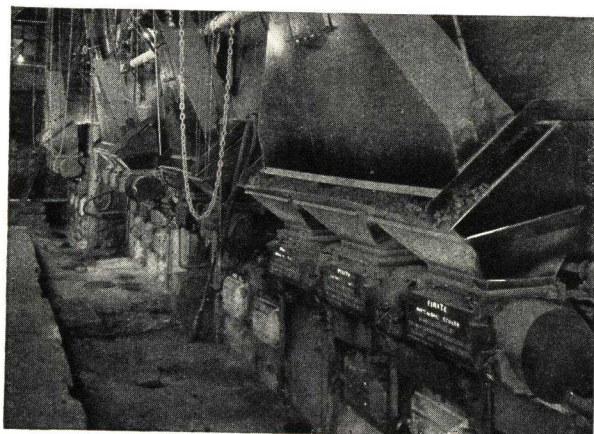
Pressure is used to introduce the air required for combustion over the entire area, beneath and through patented tuyeres and in the proper proportions—not to supply greater quantities of air over a greatly reduced area in order to burn more pounds of coal per square foot per hour, which is always an undesirable characteristic of under-feed type of stokers. Due to the novel design of Hoffman patented tuyeres, the air required for combustion is supplied in a criss-crossing and turbulent arrangement of multiple air-jets. It is physically impossible for holes to be blown through the fuel bed, thus establishing the proper ratio of air introduction over the entire area according to load. The area of the tuyere openings and the length of the tubes are pre-determined for various classes of work.

REASON NO. 7 • Simple Regulation — Instant Fuel Feed Adjustment and Quick Response to Steam Demands . . .



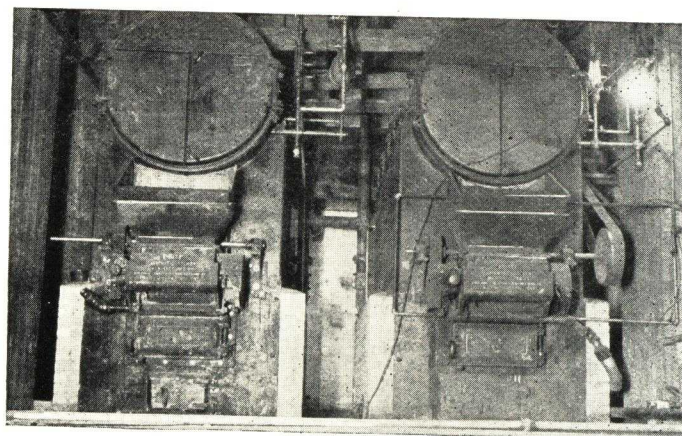
The ultimate in simple regulation is established as the entire stoker mechanism is so timed that only three to five minutes of coal supply is in the process of combustion at one time. A fire, the equivalent of 100% rating, can be produced in approximately three minutes and the combustion rate can be cut off entirely in the same length of time. Thus a drop from peak operation to low fire can be accomplished in a few minutes. Likewise an instant response to increased steam demands is available. In fact, no other method of stoker control and fuel burning can be more instantly responsive to changing loads.

TYPICAL FIRITE INSTALLATIONS AND PERFORMANCE RECORDS



Burns Local Coal at 25% Saving . . .

After completely equipping their boilers with FIRITE Stokers, The Beveridge Paper Co., Indianapolis, was not only able to burn local Indiana coal with satisfactory results and twenty to twenty-five per cent saving over the higher grade Eastern Kentucky coal that was formerly used to carry the overload, but saved the cost of the installation of a new power plant by taking advantage of the increased steam production facilities of FIRITE Stokers. Boilers, over fifteen years old, are being operated at 200 and 250% rating. Numerous analyses of the ash showed practically no burnable material left in it.



Cheap Grade, Mine Run Coal Used Efficiently . . .

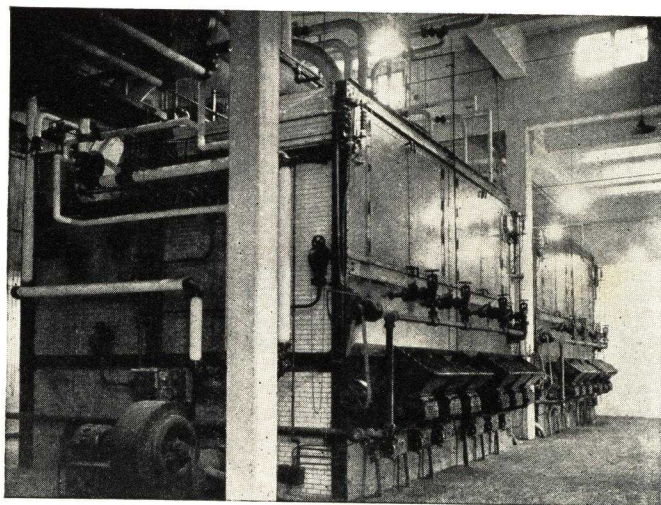
The modern apartment house requires a steam plant that will deliver steady, unfailing uniformity of heat throughout the building.

The Kean Apartments, Detroit, Mich., have found that the FIRITE Stokers they installed are completely efficient and flexible for the varied requirements of changing weather conditions and that cleaning periods are never less than twelve hours apart. The ability of FIRITE Stokers to do the job on very cheap grade of mine run coal has effected a decided operating economy, has cleared up a former smoke nuisance and "everyone concerned is entirely pleased with their performance."

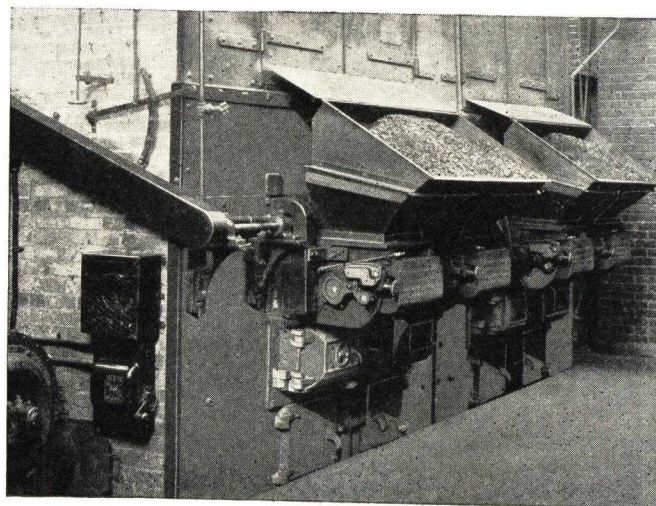
Hotel Saves \$15,000 Yearly on Fuel Alone!

The Hotel Fort Shelby, Detroit, Mich., formerly operated three 252 h.p. Union Iron Works water tube boilers with side dump stokers. Using all three boilers, peak load burned approximately 26 tons of coal in 24 hours. If one boiler was out of line for cleaning or other purposes, the increased rating on the other two boilers invariably ran into large bills on stoker maintenance. FIRITE Stokers were decided upon. It was necessary to change one boiler at a time. After the first FIRITE was installed, it was found that the Summer load could be carried on one boiler, and after the second FIRITE was on the line, that the peak load was easily carried and at a reduction of coal tonnage to 19½ tons per day, or an approximate saving of 25% due to the efficiency of

FIRITE Stokers over the single retort, side dump underfeeds. A survey revealed that installation of the third FIRITE would permit the use of coke breeze exclusively on all three boilers at a saving of \$2.00 per ton of fuel. The change was made, and a summary of the experience disclosed that the cost of fuel for steam, due to lower priced fuel and burning less of it, amounted to a saving of more than \$15,000 annually. Added to this was the elimination of brick maintenance as a result of better furnace conditions. Further, the low cost of steam has made it possible for the company to go ahead with its program of generating its own power without outside service.



Battery of 12 Firite Stokers, Installed in the Northeastern Penitentiary, Lewisburg, Pa.



Note Limited Space Required for Application

SUGGESTED SPECIFICATIONS FOR FIRITE STOKERS FOR APPLICATION TO WATER TUBE BOILER

Contractor is requested to submit proposal on one FIRITE Stoker, as manufactured by the HOFFMAN COMBUSTION ENGINEERING Co., of Detroit, Michigan, and conforming substantially to the following specifications.

This stoker shall be suitable for application to one (water) (fire) tube boiler set with furnace width of not over ft. Stoker manufacturer shall furnish lower section furnace front; one set of Hoffman patented tuyere plates (not less than sq. ft.); one dead plate; FIRITE coal feeding machines, directly applied to furnace front; one special No. Clamage SP blower, direct connected to h.p. constant speed r.p.m. motor (blower to have capacity of c.f.m. at inches); one h.p. constant speed r.p.m. stoker drive motor; all necessary hangers, pulleys, belting, shafting, etc., incidental to stoker installation. Stoker manufacturer shall furnish competent erection superintendent to supervise installation and instruct operators.

Miscellaneous trades incidental to stoker installation as follows, will be furnished by others:

Single course brick foundation for tuyere plates; fire brick protection for lower section furnace front, including opening arches;-inch air duct from blower unit to blast chamber beneath the tuyere plates; 1/2-inch water piping and fitting

to supply water-cooled bearings; all necessary labor and material for electric wiring between panel board and to stoker and blower motors, including the wiring up of these motors and the mercoid control and control starting switches furnished by the manufacturer; and common labor to erect stoker complete.

The stoker shall be guaranteed by the manufacturer to have sufficient capacity to carry the boiler at continuous 100% overload, and 150% overload for four hours.

The motors shall be guaranteed by the stoker manufacturer for one year; coal distributing units for a period of two years; and the tuyere plates for a period of three years (providing that each stoker shall have been properly operated).

Where given furnace volume of not less than one cu. ft. per rated boiler h.p., stoker contractor shall guarantee stokers to develop a combined boiler, furnace and grate efficiency of not less than 74% at 125 to 150% rating.

Upon completion of installation of stoker, the owner will have the privilege of running a test to determine the stoker efficiency; such test shall be run under standard A.S.M.E. test code conditions and in the presence of an authorized representative of stoker manufacturer.

ENGINEERING SERVICE, BLUEPRINTS, DATA, ETC.

Complete mechanical drawings and specifications will be furnished, upon request, to responsible consulting and industrial concerns or individuals for any type or size of boiler, and for capacities from 2,000 to 100,000 pounds of water evaporation per hour. Qualified engineering advice and co-operation directly pertaining to stoker problems will be gladly furnished without obligation.

The HOFFMAN COMBUSTION ENGINEERING Co. maintains efficient engineering sales organizations throughout the United States and Canada, with branch offices or distributing agencies in principal cities. Inquiries are welcomed and should be sent to our general offices in Detroit or to the most conveniently located district office or agent.

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WHITING CORPORATION

PULVERIZING & COMBUSTION EQUIPMENT DIVISION

MAIN OFFICE AND WORKS

15611 Lathrop Avenue, HARVEY, ILL.

(Chicago Suburb)

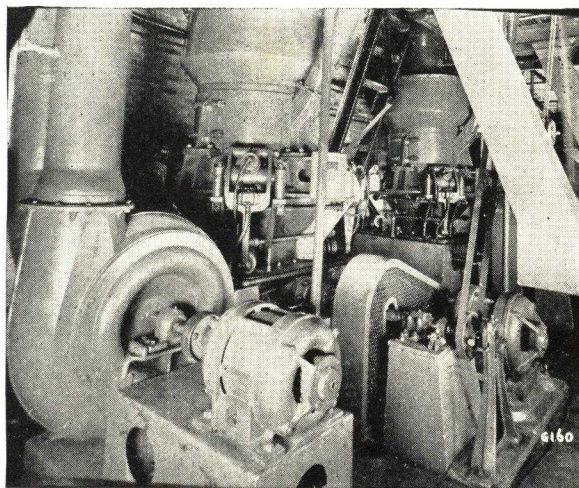
REPRESENTATIVES IN ALL PRINCIPAL CITIES

For Cranes, see other page of Whiting Corp.

Products

PULVERIZERS, BURNERS, FEEDERS, DRYERS, PNEUMATIC CONVEYING SYSTEMS, FURNACES, SWITCHING VALVES, BIN LEVEL INDICATORS and other necessary

equipment for installing complete Storage and Direct-Fired Pulverized Fuel Systems.



Two Whiting Table Roller Pulverizers in Boiler Room of Armour & Co., West Fargo, N. D.

Table Roller Pulverizer

This is a slow speed pulverizer employing large rollers forced against single piece track by spring pressure. The air separation principle is employed insuring uniform pulverization. Drying and pulverizing are accomplished simultaneously by using hot air or gases.

Power consumption is 50% lower than all other types of pulverizers. A decided attrition action in addition to crushing is a feature of this mill. No shut-downs required for lubrication. Practically all kinds of material can be pulverized in this mill.

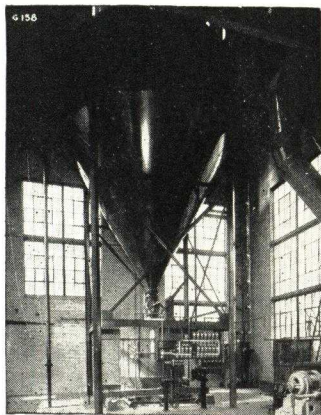
Built in 3 sizes—5000 to 30,000 lbs. per hour.

Pneumatic Conveying Systems

A very economical way of conveying all kinds of finely pulverized materials. Blowing tank is mounted on a scale so that the amount blown to individual bins can be accurately weighed. Materials can be conveyed 4000 ft. by means of compressed air.

Cost of conveying—5¢ to 6¢ per ton of material.

No pumps or moving parts to wear out.



Pneumatic Conveying System

Showing 60-ton storage bin, 5-ton blowing tank, signal board and 4-in. conveying line

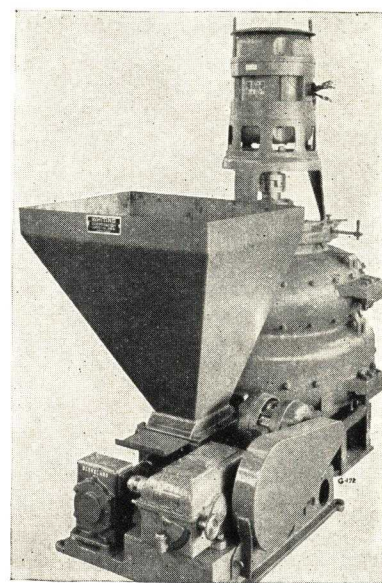
Air Separation Pulverizers

This is a popular pulverizer for firing all types of metallurgical furnaces and small boilers. The bottom chamber contains the pulverizing elements, the upper chamber contains the blower.

Built in 3 sizes—50 to 4000 lbs. per hour.

Many Applications

WHITING CORPORATION leads in metallurgical installations—over 250 air furnaces and annealing ovens are fired by Whiting pulverized coal equipment. Other installations include steel mills, roll foundries, cement mills, gypsum plants, power houses, railroad shops, automotive plants, chemical works, etc. Estimates and bulletins on request.



No. 15 Whiting Pulverizer

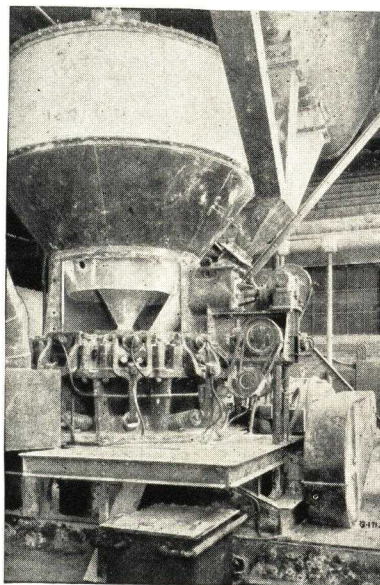


Table Roller Pulverizer in Gypsum Plant

Materials Pulverized

Asbestos Products
Bauxite
Bentonite
Borax
Clays
Chalk
Chemicals
Coal
Cocoa Cake
Dry Colors
Dyestuffs
Face Powder
Fertilizers
Filter-press Products
Food Products
Fullers Earth
Gypsum
Hydrated Lime
Kaolin
Limestone
Mica
Paint Pigments
Soap Powders
Sulphur
Talc
White Lead
Zinc Skimmings

PEABODY ENGINEERING CORPORATION

Manufacturers of Burners for Oil, Gas and Pulverized Fuel in All Combinations

580 Fifth Avenue
NEW YORK, N. Y.

Products

PEABODY COMBINED GAS and OIL BURNERS.

PEABODY THREE-FUEL BURNERS for PULVERIZED COAL, GAS and OIL.

Also Peabody Wide Range Mechanical Atomizing Oil Burners; Peabody Steam Atomizing Oil Burners; Peabody Pulverized Coal Burners for all capacities.

Swing Fronts and Insulated Fronts for all Peabody Burners.

Power Economy

In these days where gross incomes have been greatly reduced, company executives have found it necessary to curtail expenses by drastic economies. Many, however, have gone further and modernized their plants to take advantage of the present all-time low prices on equipment.

Big Savings

Remarkable savings are now possible in many parts of the country by burning lower priced fuels such as oil or gas, which are selling at prices that result in lower power costs than when burning coal.

Peabody Burners are now available in a wide range of sizes and types to best meet the requirements of every service. An investigation of the savings possible in your plant may prove that it will be far more economical to install Peabody Burners firing a cheaper fuel than to make expensive repairs to the existing equipment.

Business retrenchment means operating economy—not progress curtailment.

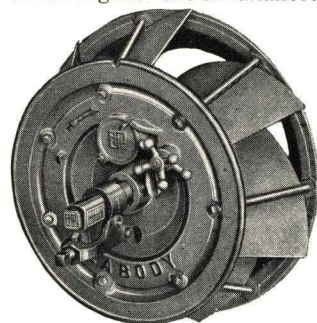
Peabody engineers will be glad to be of assistance in the study of all investigations to economically modernize a plant.

Peabody Air Register

Burners for all fuels are built around the Peabody Air Registers so that all units easily combine to produce a burner for one, two or three fuels, retaining the individual advantages of all, and making it possible to burn at all times the most economical fuel where several are available.

The design of the Peabody Air Register is largely responsible for the marked success of all Peabody Burners. The air doors of the register are simultaneously adjustable and, as the amount of door opening is varied, the degree of rotation given the combustion air is also altered to suit varying conditions.

The combustion air enters through the register and is given a rapid rotary motion by the adjustable air doors. This whirling column of air passes through the screen of fuel thrown across the burner throat and carries the fuel, intimately mixed with air, into the furnace where it is completely consumed with a short turbulent flame.

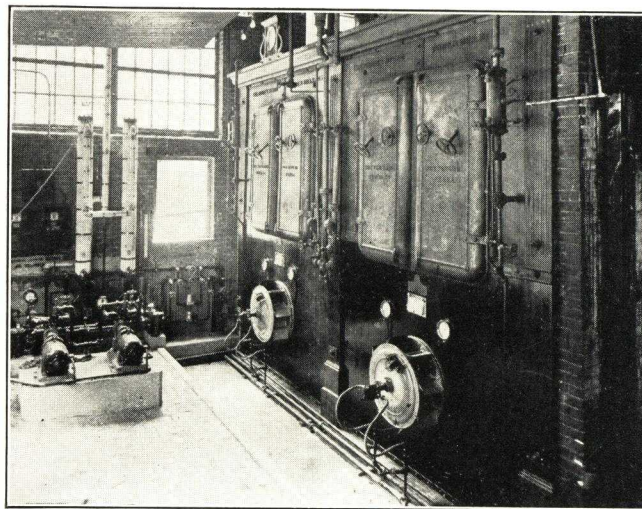


Peabody Air Register

Economical Operation at All Loads

The Peabody Air Register, which provides for accurate flame shape control, combines with the Peabody Wide Range system of operation and allows for a great load fluctuation with the highest possible efficiency at all capacities.

The Peabody Atomizer is the only atomizer of the pressure type which possesses a wide range in capacity without loss in atomizing power, and which can be adjusted to suit the exact



A Typical Peabody Conversion from Coal to Oil Firing

load conditions. This is accomplished by maintaining, undiminished, the whirling motion of the oil in the conical chamber of the tip over the entire output range of the atomizer. Instead of spraying all of the oil which tangentially enters the central tip chamber, as must be done in all other mechanical atomizers, a part, after passing through tangential slots, is diverted from the central chamber and returned to the pump suction or storage tank.

This method of control is not dependent on individual burner adjustment, which can never produce identical capacities from each of several burners firing a furnace. Neither is it a "High-Low" control with a definite maximum and minimum capacity and only partial and inadequate control at intervening capacities obtainable by altering the inlet oil pressure. The control is absolute for each minute variation in capacity from maximum to practically a "banked fire" condition.

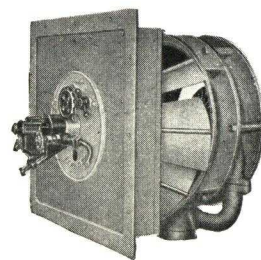
Peabody Combined Burners

Peabody Combined Gas and Oil Burner—Designed to meet the demand for a burner which, while maintaining the highest efficiency with either fuel, may be quickly changed from one to the other, and in which the gas burning parts of the equipment will be protected against distortion by overheating when burning oil only, and vice versa.

This unit combines the wide range oil burner with a gas burner, giving high capacity with relatively low gas pressure, a wide capacity range and a rapid mixture of the fuel with the combustion air. This air, entering through the register, cools both burners at all times.

The fact that both fuels may be burned at the same time greatly facilitates the change from one fuel to the other. The entire plant, with any number of burners, can in this way be changed from either one of the fuels to the other within a minimum time and without loss in steaming capacity.

Peabody Three-fuel Burner—Combines the features of the Gas and Oil Burner with the well known Peabody Pulverized Coal Burner to provide great flexibility in burning liquid, gaseous and pulverized fuels.



Peabody Combined Burner

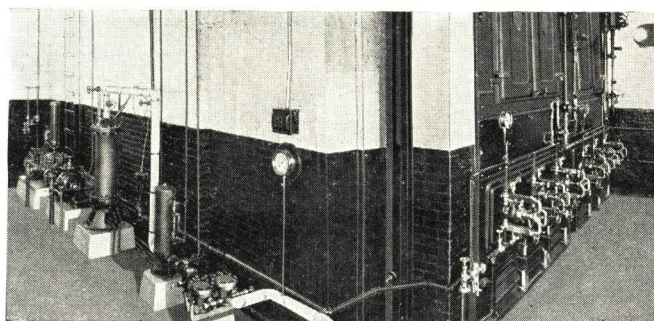
YORK OIL BURNER COMPANY, INC.

YORK-LALOR DIVISION

YORK, PA.

Manufacturers of DOMESTIC, COMMERCIAL and INDUSTRIAL OIL BURNERS—automatically and manually controlled, air or mechanical atomization, pressure or

horizontal rotary; Low and HIGH PRESSURE OIL BURNING BOILERS—cut-off, non-syphoning, relief and regulating valves; PREHEATERS and AIR CUSHIONS.



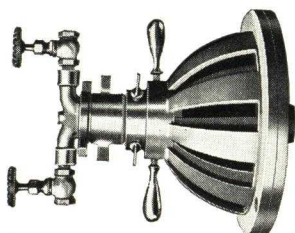
A Typical York-Lalor Installation

Atomizing Burners

York-Lalor Mechanical Atomizing Burners are of a high efficient type and are built in every range of heating capacity to meet every industrial requirement. This equipment will operate with natural or forced draft, using the heavy low Baumé grades of fuel oil. The patented scientific design provides a high efficiency.

Low Pressure Burners

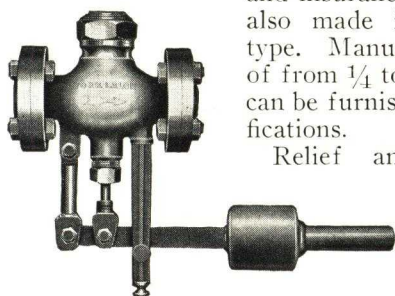
These burners are made in all sizes adaptable for use where low price is essential. The atomization is accomplished by means of air or steam.



York-Lalor Low Pressure Atomizing Burner

Automatic Shut-off Valves

These patented valves are for use on any gas or liquid pipe line where the material is forced through under pressure. An overfeeding or break in the line automatically closes the valve with comparatively no loss. Approved by the Underwriters and will reduce fire hazards and insurance rates. This valve is also made in the non-syphoning type. Manufactured in stock sizes of from $\frac{1}{4}$ to 8 ins. and larger sizes can be furnished according to specifications.

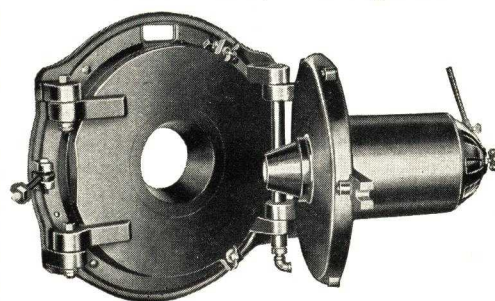


York-Lalor Automatic Cut-off Valve

Relief and regulating valves adaptable for water, oil or air; made in sizes from $\frac{1}{2}$ to 3 ins., high or low pressure, brass or iron.

York Horizontal Rotary Burner

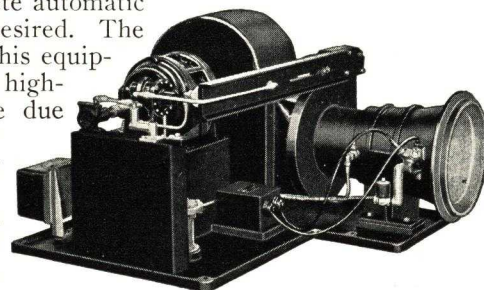
The York Horizontal Rotary is a self-contained motor driven oil burner of the mechanical, centrifugal atomizing type, consisting of a totally enclosed motor with a hollow shaft, through which the oil is fed to the atomizing cup. The blower is



mounted on the motor shaft. A slow speed rotary fuel oil pump which is worm gear driven delivers the oil through proper regulating valves to the atomizing cup. Number five oil without preheating or No. 6 oil preheated to 160 degrees Fahrenheit can be used. Built in sizes from 15 to 600 horsepower.

York-Lalor Automatic Burner

This type is used on low and high pressure boilers where complete automatic operation is desired. The efficiency of this equipment is of the highest obtainable due to the patented iris shutter which definitely controls the rate of combustion. A minimum



CO₂ of 13.5 per cent is guaranteed and maintained continuously regardless of draft or climatic conditions. Available in five sizes up to 250 horsepower.

Iris Shutter Valve

This patented iris shutter accurately controls the proportion of air or gas necessary to the quantity of fuel to obtain and hold balanced combustion and the CO₂ content. Provides an oxidizing, reducing or neutralizing flame. Built in all sizes for either manual or automatic control.



York-Lalor Iris Shutter Valve

Manufacturers of Oil Burning Equipment Since 1897

THE AIR PREHEATER CORPORATION

Manufacturers of the Ljungström Air Preheater

40 East 34th Street, NEW YORK, N. Y.

WORKS: WELLSVILLE, N. Y.

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ST. LOUIS, MO.
ST. PAUL, MINN.
TACOMA, WASH.
WASHINGTON, D. C.

Product

THE LJUNGSTRÖM AIR PREHEATER for recovering heat from flue gas, preheating combustion air, improving boiler efficiency, increasing steaming capacity, and effecting substantial fuel and money savings in public utility and industrial steam power plants, industrial furnaces, oil stills, etc.

The Ljungström is the only universally used air preheater with over 600 installations throughout the world, selling organizations on every continent and producing factories in seven countries. Installed on over 9,000,000 sq. ft. of boiler heating surface in the United States.

Benefits from Recovering Waste Heat and Preheating Combustion Air

Flue gas discharged to the atmosphere at ordinary temperatures contains the heat from 300 to 425 lb. of each ton of fuel burned. Recovery and return of 70% of this otherwise wasted heat to the furnace by using it to preheat the combustion air, does as much additional useful work as though the recovered heat were obtained from an equivalent additional amount of fuel. The useful heat return, and therefore the fuel saving, is 10% to 15% higher than with cold air used for combustion. With preheated air, combustion starts quicker, is more uniform, is more thoroughly completed within the furnace, less soot is produced, and from solid fuel less combustible is lost in the ash and trouble from clinkering is reduced. Less excess air supports combustion and the draft fans may be smaller. Fuels with high moisture content burn more economically and with much higher efficiency, due to the high recovery obtainable from gases of high specific heat.

The benefits also apply with pulverized coal, oil, gas, etc.

Greater Steaming Capacity—Preheated air puts more heat units into the combustion chamber, speeds up the combustion rate of the fuel-burning equipment, and increases boiler capacity to an extent at least equal to what would be accomplished by burning 10% to 15% more coal with air of normal temperature.

Preheated air effects very pronounced steaming capacity increase in burning wet wood. Our experience indicates that in a furnace of given size and burning wood of 50% moisture content, preheated air increases the fuel burning rate and steaming capacity 50% over the rates obtainable with cold air.

This higher steaming capacity for extended periods or for swinging peak loads is as dependably produced as though the number of boilers was increased, and it is obtained with the Ljungström Air Preheater at a fraction of the investment necessary to obtain equal increased capacity and smoothness of operation from additional boilers and fuel-burning equipment.

Higher Boiler Efficiency—Preheated combustion air adds from 4% to 10% to the boiler efficiency in new plants, and usually more in old plants. The efficiency gain also includes the secondary benefit of better utilization of radiant heat and better heat transfer, because of the more complete combustion and the higher temperature in the furnace.

Boiler surface exposed to the furnace generates most of the steam and that near the cold end very little. By cutting out the most sluggish surface and substituting Ljungström Preheater capacity for reducing the gases to the same final temperatures, the same over-all efficiency is obtained at lower plant cost, as the necessary Ljungström Heating Surface costs only about half as much as the boiler surface it displaces and is less expensive to maintain.

Instead of applying this saving to cost reductions, it may be invested in additional Ljungström Preheater capacity to produce a fuel and firing labor saving of at least 10 per cent without capacity decrease.

Further reduction in plant cost is practical by using high preheat, as the Ljungström Preheater has the unique characteristic

of obtaining the added increment of preheat at a very small proportionate cost.



The Ljungstrom Air Preheater

The Ljungström Air Preheater is the only one employing the continuous regenerative counterflow principle, and holds the records for highest practical heat recovery (approximately 70%) from apparatus of minimum size, volume, weight and costs and for highest net annual money return.

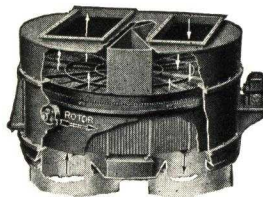
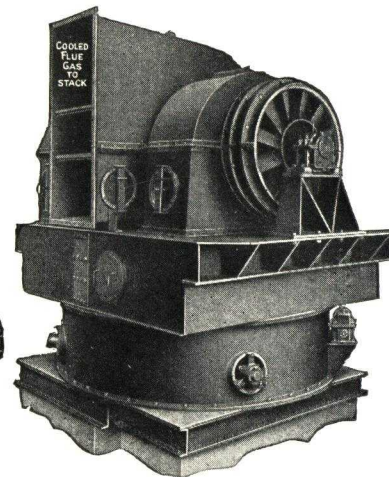
The newer models make preheated air more profitable where its use had already been practical, and also offer substantial annual net money return to plants of smaller load and use factors, where former recovery costs prevented a justifiable return.

Operating Principle—Flue gas is drawn upward in one vertical half of the casing through a horizontal honeycombed metal rotor and the combustion air is forced downward through the opposite part of the rotor. Continual slow motion of the rotor at the rate of not over 3 r.p.m. carries heat absorbed from the gases around to the other side and the heating surface in the rotor here gives up this heat to the combustion air. Separate forced and induced draft fans of any make can be used or the fans may be integral with the preheater. Rotor is driven by small electric motor through speed reducer. Power consumption is negligible.

At Right:

Type CAN Ljungström Air Preheater with Integral Forced-draft and Induced-draft Fans

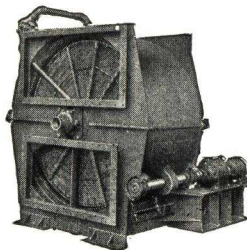
The scroll fan housings in connection with axial fan wheels greatly increase fan capacity and decrease operating power requirement



Above:

Type CANX for Use with Independent Forced-draft and Induced-draft Fans

Operated with rack and pinion drive, and has a center thrust bearing in the cold air side of the top housing. For boiler units of 1000 hp. and over



At Left:

Type CHNX Horizontal-flow Used with Independent Forced-draft and Induced-draft Fans

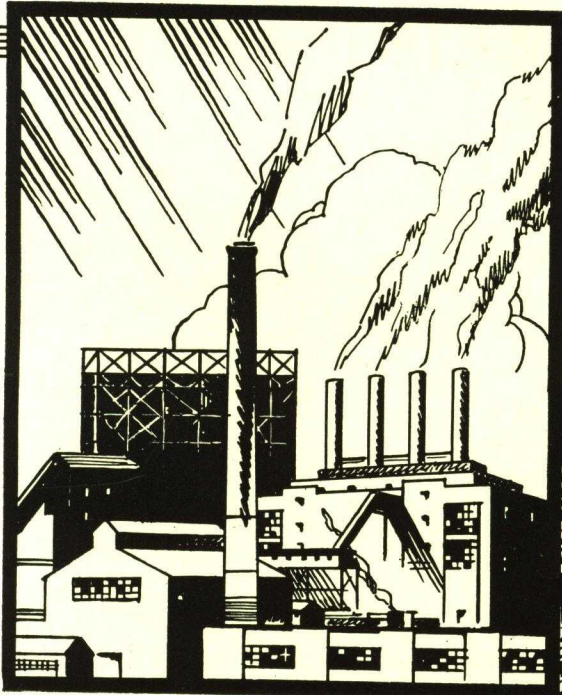
Made in three constructions for maximum flue-gas temperatures of 1000° F., 1400° and 1800°, respectively. Especially desirable for high temperature industrial work. Also built with integral fans

Rotor—The rotor has a built-up framework into which the heating element assemblies are dropped by gravity and from which they are removed by simply lifting out. Reversal of the elements after corrosion at the cold ends restores efficiency, and complete heating element renewal, although seldom if ever necessary, can be effected at a cost less than 15% of the initial investment.

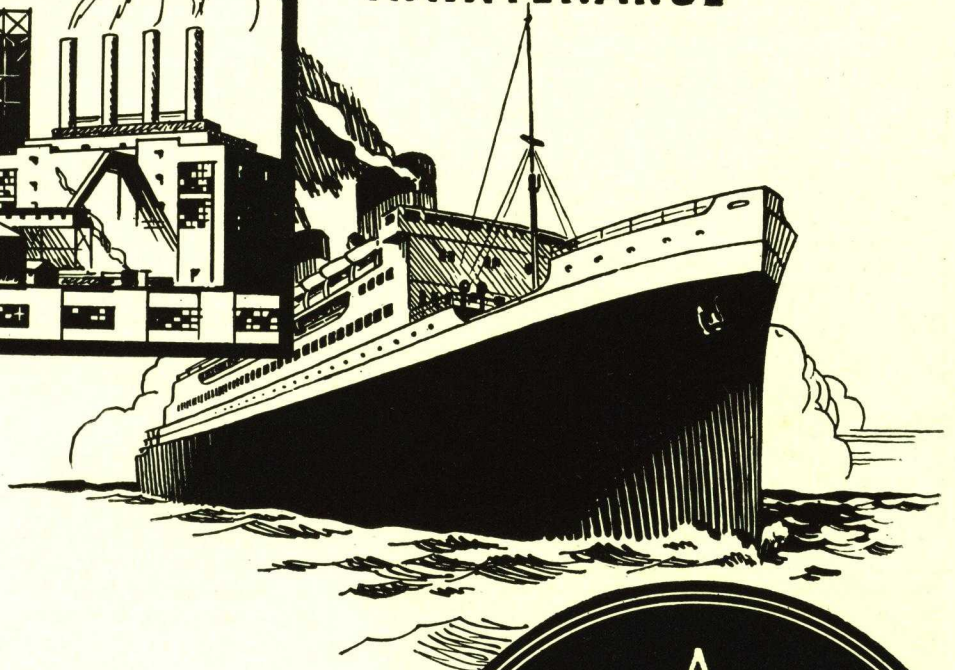
Write for free engineering advice, performance and cost data, guarantees, references and our latest bulletin.

CONDENSER SERVICE & ENGINEERING CO., INC.

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ENGINEERING
DESIGNING
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AFFILIATED COMPANIES
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NEW YORK, N.Y.

A
**COMBINED
SERVICE**
TO THE ENTIRE
**HEAT EXCHANGE
FIELD**

This **3** POINT PROGRAM POSITIVELY **REDUCTION OF** ON CONDENSERS AND OTHER CLASSES

The CONDENSER SERVICE & ENGINEERING CO., INC. is saving thousands of dollars annually for users of tubular heat exchangers by rendering an inexpensive MAINTENANCE SERVICE that assures a profitable continuity of operation.

Guided by the knowledge acquired through wide experience, we have developed appliances that prolong tube life, as well as a sound and inexpensive method of testing tubes that, in most instances, obviates the expense of complete retubing.

Since proper maintenance results in economical operation, we offer this 3-point program with the assurance that it will pay substantial dividends in savings that accrue from increased tube life . . . improved operating efficiency . . . lower maintenance costs.

We have many customers in the Utility, Industrial, Oil Refinery and Marine fields . . . clients who exact the utmost in quality and speed of workmanship. It is significant that they are now the strongest advocates of our MAINTENANCE SERVICE. Their satisfaction is based on better performance and reduced maintenance costs.

1

AIR and EROSION ELIMINATOR

(Patented)

**Removes the Cause
 Prevents Electrolysis**

**Stops the Effect
 Resists Dezincification
 Stops Air Erosion**

Air in the circulating water is conceded to be the chief cause of tube-end deterioration. Before the development of the AIR and EROSION ELIMINATOR no effective means of removing the air from the circulating water was available to the condenser operator.

Now, however, this patented device eliminates that destructive element and, at the same time, stops electrolytic action and dezincification. It is not possible to state, at this time, exactly how much tube life is extended but there is one case where it has been *tripled after the tubes were condemned*, with no signs of failure to date. A number of cases exist where tube life has been doubled, also with no indication of failure. It will be some time before we know if tube life is continued indefinitely or if the average life is multiplied by 4 or 5.

We are constantly receiving repeat orders from users in widely diversified fields. One of the largest companies of its kind, starting with the installation of a single unit 3 years ago, subsequently installed 27 additional units. Further testimony as to the efficacy of the AIR and EROSION ELIMINATOR is to be found in the report made by a large public utility in an official document reading in part as follows:

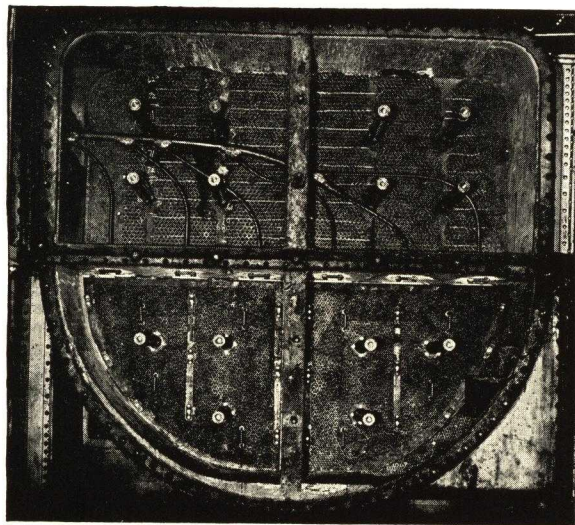
"Difficulty was experienced due to the erosion or corrosion of tube-ends. The situation was quite serious and resulted in numerous tube losses." (Here a description of the AIR and EROSION ELIMINATOR previously installed is interpolated and the report continues:) "The result has been the complete elimination of all further corrosion or disintegration difficulties to date . . . an interval of 8 months."

It is interesting to note that since this report was made an additional period of 16 months has elapsed and so far there have been no tube failures of any kind.

Are not 2 years of additional trouble-free service from a set of condemned tubes sufficient testimony to justify the installation of the AIR and EROSION ELIMINATOR?

CONSTRUCTION AND OPERATION

A frame is built to fit the inlet water-box. To this frame a number of perforated plates, composed of a special metal, are fastened and the entire unit is installed in the water-box facing the tube sheet. All fastenings are of stainless steel or bronze. Entrained gases are liberated as the circulating water passes through the perforated plates. These gases accumulate above the surface of the water and are carried off by a series of nozzles leading through a manifold either to atmosphere or the discharge water leg. Instead of the tube-ends and tube sheet, the perforated plates (or deaeration screens) are attacked by the liberated gases and are gradually destroyed. *These plates are easily and quickly removed and replaced at very little expense.*



An Air and Erosion Eliminator Installed on 40,000 Sq. Ft. Surface Condenser

EVERY USER SATISFIED AND EVERY INSTALLATION SHOWING REMARKABLE SAVINGS

ASSURES MAINTENANCE COSTS OF HEAT EXCHANGE EQUIPMENT

MAXIMUM
EFFICIENCY
•
ECONOMICAL
PERFORMANCE

2

HYDRO-DYNAMIC SHOCK TESTING

(Patented)

A Startling Method of Tube Testing Which Is Saving Thousands of Dollars in the Maintenance of Tubular Heat Exchange Equipment

Years of intensive specialization have demonstrated to us that a relatively high percentage of tubes in heat exchangers are prematurely replaced.

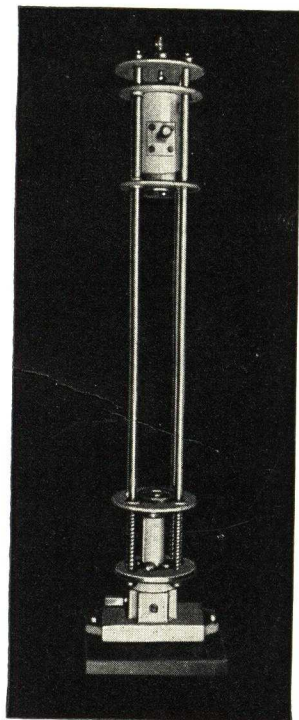
The decision to retube is usually the result of an increasing number of service interruptions, and in the absence of an accurate method of testing, the operator has no alternative but to order a complete retubing job. This often results in tubes which have a substantially longer potential service life being discarded along with a relatively small percentage of defective tubes. This wasteful procedure is prevented by the HYDRO-DYNAMIC SHOCK TEST.

The SHOCK TEST is applied at accurately predetermined pressures to each tube, either in or out of place. Tubes that are about to fail in service are destroyed, and those capable of rendering further satisfactory service are salvaged. As a result, money and time are saved and service interruptions are minimized.

The importance of applying the HYDRO-DYNAMIC SHOCK TEST is not confined alone to old equipment. In a recent publication a large public utility recommended that it be applied to new tubes in order to prevent a class of failure which sometimes occurs shortly after retubing.

There is absolutely no reason now for premature retubing . . . consult with us and find the way to greater economies.

Substantial savings have been realized by the owners of all classes of heat exchangers who have availed themselves of this important service. References furnished on request.



The Patented
Hydro-Dynamic Shock
Testing Machine

3

"WIZARD" CONDENSER INJECTOR

(Patents Pending)

For Stopping Condenser Leaks Without Shutdown

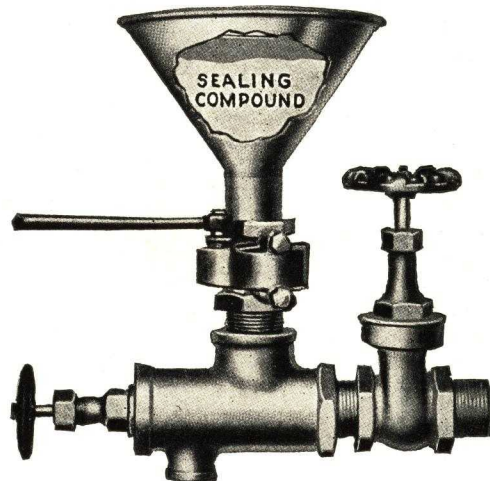
A practical, convenient and almost instantaneous method of stopping condenser tube leakage by injecting a dry sealing mixture into the circulating water. This mixture stops leaks. It is inexpensive and entirely harmless . . . it cannot damage or reduce the efficiency of the condenser in any respect.

The INJECTOR prevents the contamination of boiler feed water . . . reduces boiler maintenance . . . prevents service interruptions. Even where standby equipment is available time and money are saved, since the INJECTOR obviates the necessity of immediate shutdown, condensate dumping, and re-distribution of the load to other units.

The INJECTOR has no moving parts . . . it is simple in design and sturdily constructed for long service. An indication of its efficiency is the fact that one large operator, after trying one INJECTOR ordered nine more within five weeks after the first was installed.

The INJECTOR keeps your equipment operating when you want it most . . . it is, in short "the lowest priced boiler insurance on the market."

Write for a list of users.



"Wizard" Condenser Injector

INVESTIGATE THE SAVING POSSIBILITIES OF THIS PROGRAM ♦ ♦ NO OBLIGATION

CONCO GUN and CLEANING PLUG

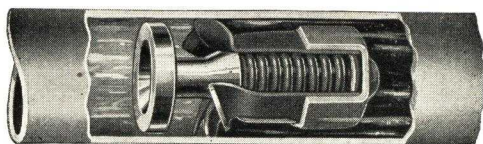
The Cleaning Plug Which Makes It Possible to Obtain That Last 1/10" of Vacuum



This is a most effective combination for keeping tubes clean. The CONCO GUN and CLEANING PLUG will do the job thoroughly . . . quickly . . . economically.

In operation, the CONCO Turbine-type CLEANING PLUG is shot through the tube by water at 100 to 200 lbs. per sq. in. pressure . . . without danger of cutting the tube. The blades are arranged to recede toward the center of the tube if too solid an obstruction is encountered on the tube sidewall. The plug is good for long service and is made of rustproof metal for 5/8, 3/4, 7/8 and 1-in. tubes . . . in 16, 17 and 18-gauges.

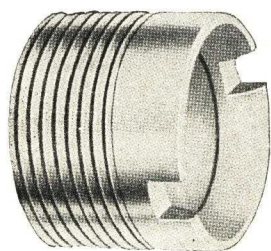
The CONCO GUN is specially designed to shoot the CONCO CLEANING PLUG and is adapted to any size cleaner by simply changing the nozzle.



Further information and a sample of the CONCO PLUG furnished on request.

FERRULES

Slotted Type



Slotless Type



We carry in stock for immediate delivery, in all standard sizes and threads, both the belled-mouth and square-shouldered ADMIRALTY MIXTURE SLOTTED FERRULES.

Operators will appreciate the advantages apparent in the smooth-flow SLOTLESS FERRULE. The slotless type prevents hydraulic disturbance at the entering edge and reduces the accumulation of debris characteristic of the slotted type. The SLOTLESS FERRULE is also furnished in all sizes, threads and materials. A special wrench is supplied for installing this type.

Regardless of how many ferrules you need or how quickly you need them we are always ready to render prompt and economical service.

Condenser plugs furnished to any specification.

"FLOWWRITES"

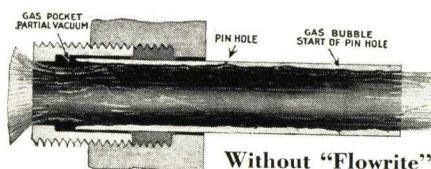
(Patented)

"The Perfect Water Inlet Nozzle for Condenser Tubes"

Save Condenser Tube Renewals by Eliminating Erosion at the Entrance Ends of Both New and Old Tubes

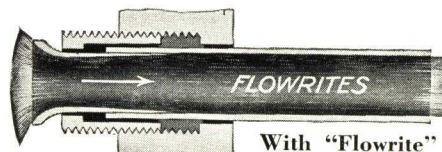
FLOWWRITES are short belled-end tubes which are inserted in the water inlet end of condenser tubes. They prolong tube life by preventing sudden contraction of the water stream in the entering end, thus avoiding liberation of gases and the accompanying tube-end erosion. Smoothly directed flow, through the use of "FLOWWRITES," insures minimum entrance friction and improved efficiency of the hydraulic circuit.

"FLOWWRITES" are furnished in sizes to fit all standard sizes and thicknesses of tubes. They are comparatively inexpensive and easy to install.



Without "Flowrite"

Note how the pocket at the end of the tube collects gas, resulting in constant corrosive action and pinholes that quickly ruin the tube-end



With "Flowrite"

It will be observed that no pockets exist at the tube-end where corrosion can begin. Note how the smoothly directed flow insures a water-filled tube. The tube is protected while all wear takes place on the "FLOWWRITES" which are easily replaced

TUBES

For Condensers and Other Heat Exchangers

We furnish tubes of all sizes and materials used in condensers and other classes of heat exchangers. In keeping with our rigid sales policy . . . "Only the best materials the market affords" . . . we handle tubes made by accredited manufacturers only. These tubes are furnished with the maker's Certificate of Analysis for your protection, and as tangible proof that our tubes meet the most exacting specifications.

The nature of our business places us in position to render exceptionally quick service on tube deliveries and installation. Whether your needs are large or small . . . a few tubes or many . . . your order will be carefully, promptly and accurately filled. All tubes shipped will conform exactly to your specifications. Where we perform the installation operation, we assume full responsibility for size, fit and packing tightness.

Whenever you need tubes . . . write, telephone or wire. Your order will be filled, without delay, at best market prices.

OUR REPUTATION IS BASED ON QUALITY MERCHANDISE AND FAST SERVICE

CONDENSER PACKING

We Carry a Complete Line of Corset Lace, Fibre and Metallic Packing

Each type of packing has been thoroughly tested in service and we believe each to be the best of its type available. Regardless of the type you select, you are assured of the utmost in economical and dependable performance.

Corset Lace Packing

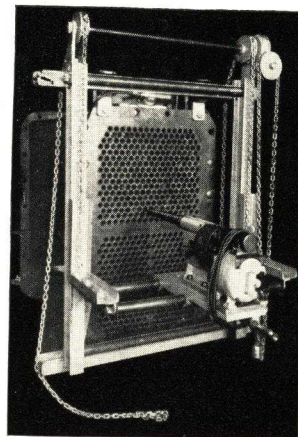
We carry in stock in all sizes from No. 30 to No. 96.

You will be interested in our quick and efficient method of installing Corset Lace for permanent tightness.

The Modern Method of Installation with Patented Power Driven Tool

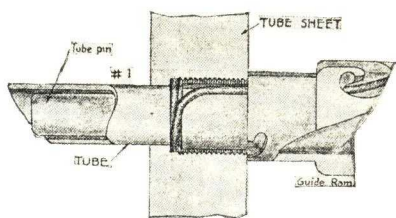
In our method of installation we use a special power-driven tool which inserts an oversize lace (No. 72) so firmly in place that it will remain intact, *without leakage*, for the life of the tube. The tight and uniform windings protect the inlet end so that after a long period of use it is frequently possible to remove the tube without damage . . . reverse it end-for-end . . . and thus obtain, at a very slight cost, a considerable extension of tube life.

The hand tool method of ramming in (not winding) a small size corset lace (No. 30) is not satisfactory. The use of a No. 72 braid insures an absolutely tight gland when installed by our method because (a) there is no overlapping of braid; (b) no cutting of braid on threads; (c) the braid remains in one piece starting from bottom of stuffing box; (d) the braid is tightly wound, just fitting the box, giving the effect of a gland having been packed with correct sized packing; (e) the ferrule is not required to drive the packing home—it merely serves as a retainer and (f) the tube ends, therefore, cannot become damaged by undue tightening of ferrules.



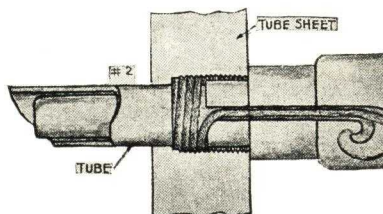
(Patented)
The Patented Power Driven
Packing Tool

How the Braid Is Installed



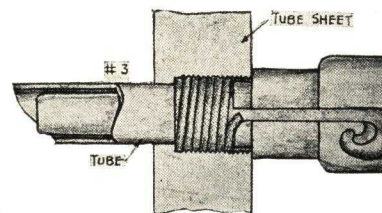
Step No. 1

Step No. 1—A full turn of braid is taken around the tube pin and up through the outer sleeve.



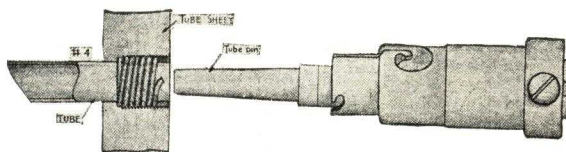
Step No. 2

Step No. 2—An inside sliding ram then drives the braid tightly against the bottom of the stuffing box.



Step No. 3

Step No. 3—By locking and revolving the tool (by hand, air or electricity) the braid is threaded in and wound tightly in the stuffing box to proper distance from the end of the box.



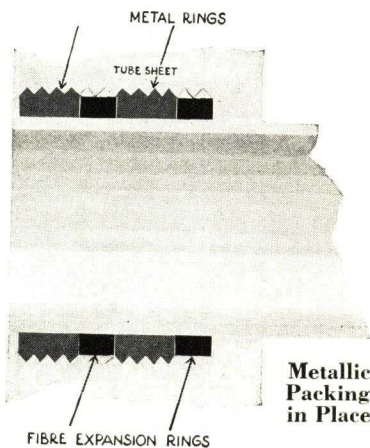
Step No. 4

Step No. 4—The braid in place and the tool withdrawn.

Fibre Packing

We carry in stock a complete line of Fibre Packing in all standard sizes and thicknesses.

Regardless of the quantity you need, your order will receive our careful attention. We specialize in emergency orders.



Metallic
Packing
in Place

Metallic Packing

For use with or without ferrules.

Our "Metallic" is easy to install. It is also easy to remove . . . it comes out like a string . . . no sticking in the threads of the stuffing box.

All standard sizes carried in stock.

GET OUR PRICES BEFORE YOU BUY OR INSTALL PACKING

THE COMPANY

and the Scope of Its Activities

The CONDENSER SERVICE & ENGINEERING CO., INC., was organized primarily for the purpose of rendering a prompt and efficient Maintenance Service in the field of surface condenser and heat exchanger application. So varied and involved are the factors entering into the problem of tubular heat exchange maintenance, that the service of specialists, highly trained in the field of research peculiar to such apparatus, is essential in order that charges against this element of operating costs may be reduced to a minimum.

An organization so constituted and including, in addition, a staff of engineers with years of experience in every phase of condenser and heat exchanger *design, manufacture, maintenance and operation*, places the CONDENSER SERVICE & ENGINEERING CO., INC., in position to offer this invaluable service to users of all classes of heat exchange apparatus.

Although we specialize in maintenance, we have been called on to correct defects in design—defects which were not only troublesome but frequently the direct cause of failure in service. When we design (or re-design) the equipment, every phase of the operating and maintenance problem is taken into consideration and our procedure is governed by past experience.

With a view to further giving the Power Generating Industry and other users of condensers the benefits accruing to our complete designing service, maintenance service and manufacturing facilities, we are pleased to announce the addition of the latest and most modern of *High Vacuum Surface Condensers* to our line of manufacturing activities. Bulletins treating this subject will be issued shortly. In the meantime, inquiries will receive our prompt attention.

The service of our Engineering Staff is always available to assist in the solution of any Heat Exchange problem.

Consultation involves no obligation

The activities of
**THE INSTRUMENT SERVICE
CO., INC.**
are described in detail on
Page 9

OUR POLICY

*Fast, accurate
service . . . always
dependable*

◆
*Only the finest
materials the market
affords*

The products of
**THE BLACKBURN-SMITH
MFG. CO., INC.**
are described and illus-
trated on Page 10

SERVICE

TESTING, CLEANING, RETUBING, REBUILDING

Surface Condensers
Oil Coolers and Heaters
Feed Water Heaters
Air Compressors—after-Coolers
Diesel Engine Inter-coolers
Still
Oil Refinery Exchangers
Boilers
Heat Exchange Apparatus of all classes

DESIGNING, REBUILDING, MODERNIZING

Special heat transfer equipment designed to meet specific requirements. Old apparatus re-designed and modernized.

COMPLETE INSTRUMENT SERVICE

We repair and rebuild all makes and types of Industrial, Power Plant, Oil Refinery and Marine Instruments.

PRODUCTS

Surface Condensers
Heat Exchangers of all kinds
The Air and Erosion Eliminator
The "Wizard" Condenser Injector
The "Conco" Gun and Cleaning Plug
Ferrules—Slotted and Slotless Types
Condenser Plugs
"Flowrites"—The Perfect Entrance Nozzle for Condenser Tubes
Tubes for Condensers and other classes of Heat Exchangers
Packing—Corset Lace, Fibre, Metallic

Washers—Lead and Fibre
Support Sheets
Stays
Replacement Bundles
Cleaning Fluids
Maxwell Safety Valves—Stop, Check and Non-return Types. Also special valve for compressed gas and air cylinders
Gland Seal for Rotary Pumps
Salinometer Gauge or Try Cock
Special Universal Bevel Gear Drive for remote operation of signals or valves
Feed Water Filters
Grease Extractors
Strainers
Sewage Ejectors

TURN YOUR HEAT EXCHANGE WORRIES OVER TO US ◆ ◆ ◆ IT IS THE MOST

GENERAL MAINTENANCE SERVICE

The CONDENSER SERVICE & ENGINEERING CO., INC., specializes in a Maintenance Service that has resulted, in numerous instances, in saving operators 20% and more, of their average annual maintenance costs, notwithstanding the fact that these operators formerly had full maintenance crews of their own.

We are able to effect these economies through (1) the development of effective methods of eliminating the cause of heat exchanger troubles; (2) the exclusive use of specially perfected tools invented by our technicians (the pneumatic tube puller, the broken

ferrule removing tool, the special packing tool, etc.) which greatly facilitate service operations, and (3) a capable engineering and working personnel trained exclusively and intensively in heat exchanger work and related activities.

Our operations extend through the Public Utility, Industrial, Refinery and Marine fields. The service is most complete, covering as it does engineering, designing, modernization, manufacturing and maintenance.

A FEW EXAMPLES OF OUR WORK

A large utility reported in a recent publication as follows:

"Recent operation of retubing a large unit was done by a condenser service contractor* using special tools for removing old tubes as well as for installing and repacking the new tubes. The work was expedited by the contractor and completed in approximately $\frac{1}{3}$ of the time estimated as required by the regular plant maintenance force."

*This company

Many other instances of the calibre and speed of our Maintenance Service are available. References and details gladly furnished.

Our maintenance crews have retubed two condensers containing a total of 8800 tubes, including all necessary removals and replacements, in 71½ consecutive hours.

We have completely stripped and retubed, in 24 hours, an oil refinery bundle containing 500 1-in., 12-gauge steel tubes.

OUR SERVICE IS ALWAYS AVAILABLE

Any Time	24 Hours a Day
Anywhere	7 Days a Week
In Any Emergency	All Year Round

CLEANING FLUIDS

For Heat Exchange Equipment

We have developed effective materials for cleaning the steam and water sides of Condensers, Lubricating Oil Coolers and Fuel Oil Heater Coils in place.

Each of these materials we believe to be the best and most efficient of its kind now available and each is guaranteed to do a thorough job without injury to the metal.

The fluid for cleaning Lubricating Oil Coolers and Fuel Oil Heaters . . . circulating in place . . . is par-

ticularly effective and its use will result in marked fuel economies.

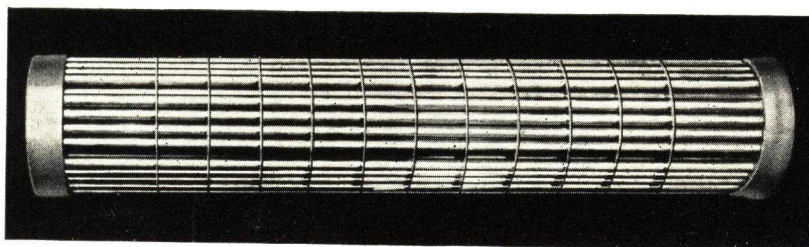
The cleaning operation may be performed by our own crews or the material will be furnished with full directions for its use.

Supplied in drums and ½-drums. Prices on application.

HEAT EXCHANGER BUNDLES

We carry on hand at all times all the material needed to furnish complete Heat Exchange Bundles of all kinds and sizes.

These bundles are supplied at extremely short notice and at unusually reasonable prices.



Oil Cooler Bundle

ECONOMICAL WAY TO PROFIT BY THE KNOWLEDGE AND EXPERIENCE OF SPECIALISTS

MAXWELL ^{DOUBLE} DISC VALVES

(Patented)

Safe in Operation**No Packing****Double Service****Permit Repair Under Pressure****For All Steam Pressures, Air, Gas or Any Liquid**

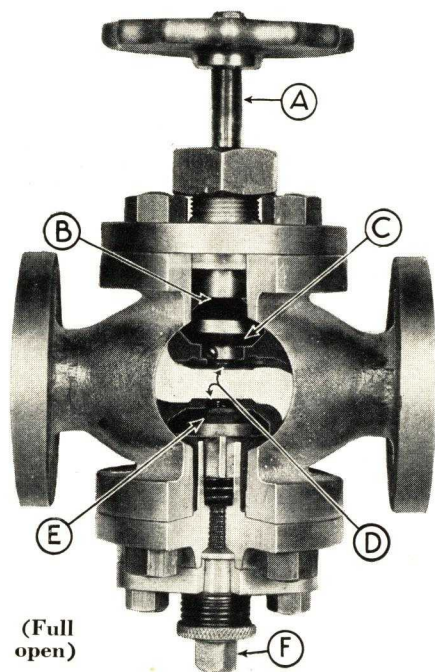
Maxwell Valves are efficient and reliable in service and exceptionally low in maintenance cost. They embody all the desirable features of the conventional type plus very definite advantages of design, construction and operation briefly enumerated below:

Safe in Operation—Maxwell Valves have no bridge. The closing strain is taken entirely by the valve discs and the seats . . . not by the valve chamber or cover.

No Packing—The elimination of packing results in lower maintenance costs and easier operation since spindle torque is reduced to a minimum.

Permit Repair Under Pressure—In case of damage to the upper part of the valve, the lower disc may be operated independently and locked in closed position permitting the repair or replacement of the upper units without shutting down pressure.

Sturdy Construction—Maxwell Valves are heavily constructed throughout for safety, durability and to insure trouble-free, dependable service. Valve discs are rigidly supported to prevent damage by vibration or wire-drawing.



SINGLE STEM VALVE
For Low Pressures

Construction Features—(A) Operating Spindle, (B) Conical member on top of the upper disc which seals the gland when the valve is open . . . this feature eliminates packing, (C) Upper Valve Disc, (D) Valve Seats, (E) Lower Valve Disc, (F) Locking Device for Lower Valve.

Operation—The valve is closed when both discs are in their seats.

To Open—The operating spindle is turned in the usual way. The first few revolutions raise the upper valve from its seat (while the lower valve remains closed) until it reaches the limit of its travel and seals the gland at (B). When the gland is sealed, subsequent turns of the spindle open the lower valve and admit pressure.

To Close—When closing, the upper valve does not start its downward travel until the lower valve is tightly seated . . . thus the seal at the gland (B) is not broken until pressure is entirely shut off.

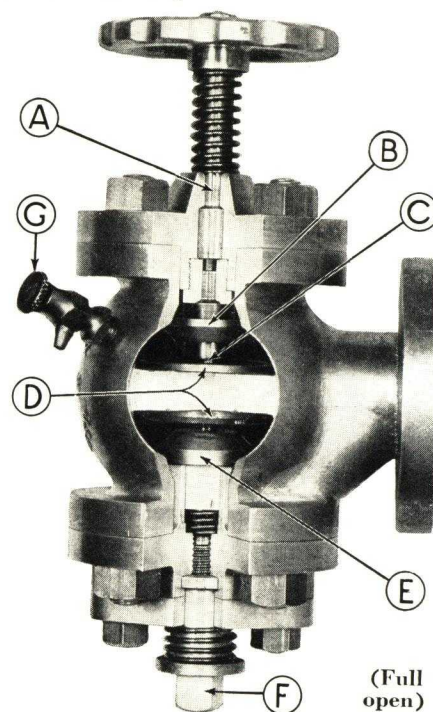
Should the spindle become damaged, a few turns of the Locking Device (F) securely locks the lower valve in closed position permitting the removal of the cover, spindle and upper valve for repair or replacement without shutting down pressure.

MAXWELL VALVES

are built to order
in
Globe or Angle Patterns
for any
Pressure or Temperature

♦
*A Custom-built Valve
to suit
YOUR Operating Conditions
at a price comparable
with that of a
Stock Valve*

Cut-away working models are available with which we will be glad to demonstrate the superior features of Maxwell Valves. No obligation.



DOUBLE STEM VALVE
For High Pressures

Construction Features—(A) Top Stem with Continuous Seal, (B) Upper Valve Disc, (C) Lower Stem which engages the Valve Discs, (D) Removable Valve Seats with nut on the bottom to prevent seat from raising under pressure, (E) Lower Valve Disc, (F) Locking Device, (G) Drain Cock to relieve pressure before removing cover.

Operation—In principle and operation this valve is similar to the Single Stem type shown at the left. It differs somewhat in design, however, since it is essential in high pressure service to maintain a continuous seal at the gland (A). This is accomplished by constructing the Operating Spindle in two parts.

The upper part of the spindle is non-rising and is of one-piece construction with the gland seal, the latter being held firmly in place against the cover plate by means of the heavy phosphor bronze spring. The valve discs are operated by a secondary stem which is recessed into the upper part of the spindle.

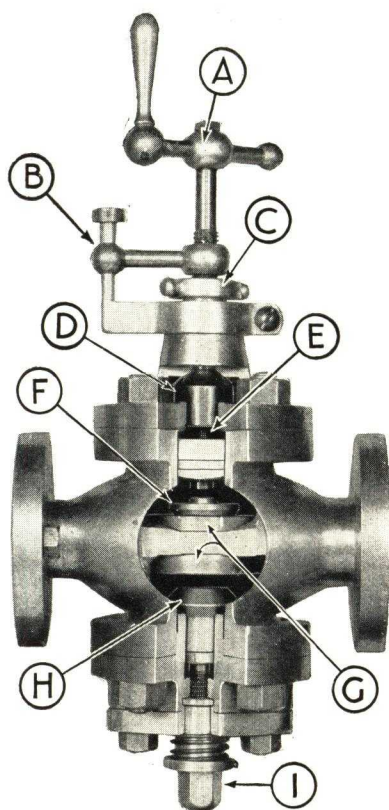
In the operation of the Double Stem Valve, as in the case of the Single Stem type, the lower valve does not open until the upper valve has reached the limit of its travel. At this point the top of the disc forms an *additional* seal at the gland. It will be observed, therefore, that before pressure is admitted the gland is *double-sealed*.

MAXWELL VALVES CAN BE FURNISHED IN ANY SIZE AND FOR ANY PRESSURE

NON-RETURN VALVE

Maxwell Non-Return Valves are furnished for all working steam pressures. Sturdy construction throughout; the Tell-tale Indicator (B) which informs the operator at a glance the exact amount of the valve opening; and the inherent advantages of Maxwell double-disc design are the features which recommend this valve to the discriminating buyer.

Construction Details—(A) Socket Stem with Adjusting Handle for setting the lift of the valve. (B) Tell-tale Indicator showing the lift of the valve. (C) Stem Lock Nut to prevent movement of the stem during operation. (D) Gland Seal which eliminates packing. (E) Adjusting Screw for governing the lift of the valve. This small unit is easily replaced and renewable at small cost. (F) Check Valve. (G) Removable Valve Seats with nut on the bottom to prevent the seat from raising under pressure. (H) Emergency Valve. When this valve is closed repairs may be made to the upper units of the valve or to the equipment in the line behind the valve *without shutting down pressure*. The lower face of this valve disc forms a seal when not in use. (I) Operating Spindle for the lower (emergency) valve.



Maxwell
Non-Return Valve

SALINOMETER GAUGE or TRY COCK

No Packing

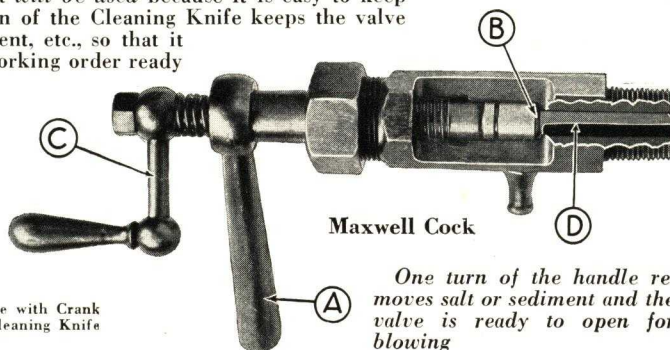
(Patented)

Self-Grinding

Protect your engineering personnel with this foolproof indestructible valve. It is indispensable on high pressure steam boilers as a Salinometer Gauge or Try Cock.

Here is a valve that *will be used* because it is easy to keep it clean. A daily turn of the Cleaning Knife keeps the valve free from salt, sediment, etc., so that it is *always* in perfect working order ready for instant blowing.

The valve body is of heavy rolled bronze. The spindle, valve and cleaning knife are of stainless steel.



Maxwell Cock

One turn of the handle removes salt or sediment and the valve is ready to open for blowing

(A) Bronze Operating Lever which opens and closes the Valve (B)
(C) Stainless Steel Spindle with Crank Handle for revolving the Cleaning Knife (D)

GLAND SEAL FOR ROTARY PUMPS

(A) Represents any impeller shaft.

(B) Bushing to fill the stuffing box of the pump. (Drive fits on outside diameter).

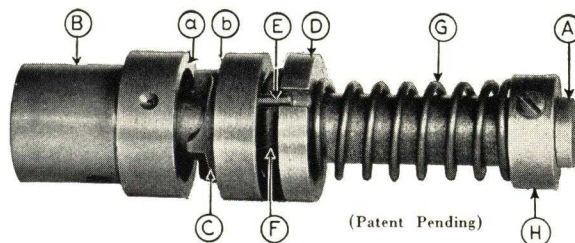
(C) Repeller. The face of the bushing (a) seals against face of the Repeller bushing (b) and forces the water back into the pump.*

(D) Driving Ring.

(E) Driving Pin.

(F) Rubber Washer to seal the shaft when the pump is stopped.

**[Prevents Leakage (Packing Does Not)
Stops Wear and Scoring of Bushing
Eliminates Friction—Increases Output]**



Maxwell Gland Seal

(G) Compression and Driving Spring.

(H) Adjusting Nut for regulating the tension to suit pump pressure.

*In the illustration at the left the Repeller (C) is withdrawn from the bushing (B) for pictorial purposes. In operation the bushing faces (a) and (b) are in contact and the Repeller (C) revolves with the shaft inside the bushing (B).

UNIVERSAL BEVEL GEAR

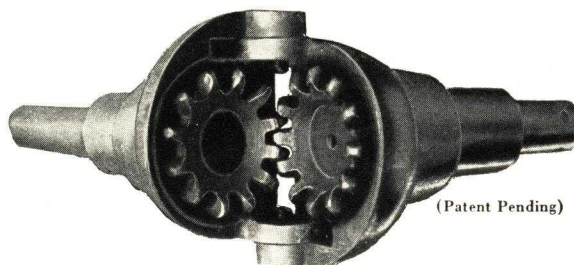
A properly guarded bevel gear assembly capable of smoothly transmitting a torque at any angle from a straight line to 135° angle in any direction.

The assembly is simple and is furnished in the form of a universal joint, it being necessary only to taper-pin the gear hubs to the driver and driven shafts.

This type of universal joint is preferred for quick assembly of reach rods and extension shafts to remote valves in ships, power plants, oil refineries, etc. It is rugged and will not freeze or corrode under outside weather conditions. Unless the operation is continuous, it requires no oiling.

The maximum angle of transmission being as great as 135° it affords great flexibility where universal joints are required. The efficiency of transmission is about 95% at all angles and its installation is recommended where a minimum number of joints is de-

sired—one Universal Bevel Gear replacing two or perhaps three universal joints having restricted transmission angles.

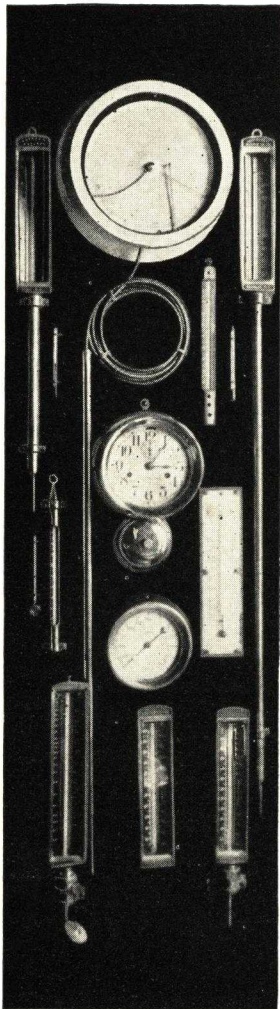


(Patent Pending)

WORKING MODELS OF THIS EQUIPMENT DEMONSTRATED WITHOUT OBLIGATION

INSTRUMENT SERVICE

All Makes and Types of Instruments Repaired and Rebuilt



We rebuild, repair, overhaul, calibrate, alter scales and ranges on practically all makes and types of Industrial, Marine, Boiler Room and Power House instruments.

This service is unique . . . *it is a specialized service* developed to the point where it is now serving Industrial, Marine, Oil Refinery and Utility fields alike in a way that has never before been attempted.

Owned and organized by the CONDENSER SERVICE & ENGINEERING CO., INC., the keynote of the organization is fast, accurate and dependable service. We have a fully equipped shop, supervised by competent engineers. A high standard of quality is attained through rigorous inspection. These facilities enable us to offer you advantages in the maintenance of your instruments which we believe are unsurpassed.

Estimates furnished promptly and without obligation.

Convenience

All your instruments are handled by *one* responsible organization.

Speed

We will return instruments with the utmost promptness. A recording thermometer, for example, in two weeks. Less time in emergencies.

Service

We call for and deliver in the Metropolitan Area of New York.

Emergencies

We work 24 hours a day . . . 7 days a week when required in emergencies. We have repaired gauges and thermometers in two hours.

We Repair and Rebuild

Recorders

All makes and styles

Thermometers

Industrial, Dial, Distant Reading

Gauges

Pressure, Vacuum, Draft, Recording and Indicating

Balances

Analytical and Dial

Clocks

Watchman's, Ships, Time, Chronometers, Stop Watches

Counters

Revolution, Operation, Yardage, Vibratory Tachometers, Speedometers

Flowmeters

Water, Steam, Oil, etc.

Electrical Meters

Ammeters, Voltmeters, Wattmeters, Pyrometers, Potentiometers

Barometers

Thermostats

Hygrometers

Mixing Valves

Pneumercators

Stack Controls

Control Valves

CO₂ Recorders

Mercury Columns

Dial Micrometers

Engine Indicators

Signalling Attachments

Remote Reading Instruments

Automatic Temperature Controls

All Repair Work Carries a New Instrument Guarantee

INDUSTRIAL THERMOMETERS

We manufacture all types of Industrial Thermometers. Standard ranges carried in stock for immediate delivery at unusually attractive prices. These instruments are guaranteed as to accuracy and quality of workmanship. Only the finest materials are used in their manufacture and the highest available type of experienced labor is employed.

No matter what kind of a thermometer you need . . . *we can supply it promptly.*

**We Will Build Special
Instruments to Suit
Your Needs**

**We Have Many
Rebuilt Instruments
in Stock**

Our ability to render dependable, satisfactory service is demonstrated by the fact that

Railroads
Public Utility and
Service Corporations
Industrial Plants
Power Plants
Refineries
Marine
Milk Companies
Bakeries
Paint Manufacturers
Chemical Manufacturers

are among our customers.

SAVE MONEY AND TIME BY USING THIS RELIABLE INSTRUMENT REPAIR SERVICE

Blackburn-Smith FILTERS, STRAINERS and SEWAGE EJECTORS

Efficient

Reliable

Economical

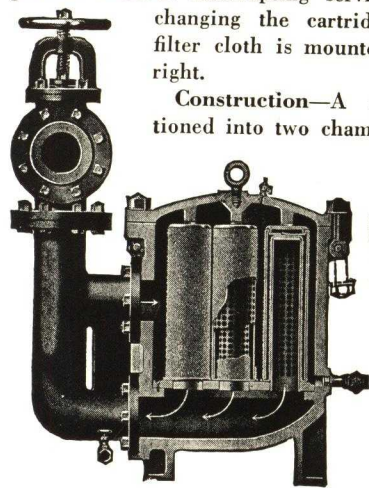
FEED WATER FILTER AND GREASE EXTRACTOR

The Filter with Long Life . . . It Has No Moving Parts

Removes oil and grease from water, removes impurities from boiler make-up water, saves coal and water, effects more efficient heat transmission in boilers.

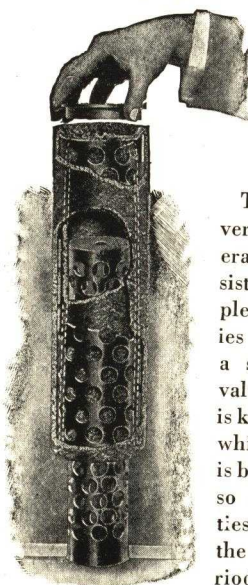
Effective for removing dirt, clay, sediment and mechanically suspended particles from water supplied for industrial processes, swimming pools and drinking water systems.

Cleaning requires only a few minutes and is accomplished without interrupting service. It consists of changing the cartridges on which the filter cloth is mounted as shown at the right.



Section of Filter Body

Construction—A filter body, partitioned into two chambers, causes the filtration of all water through a number of small easily handled cartridges, consisting of two concentric perforated brass cylinders covered with terry cloth.

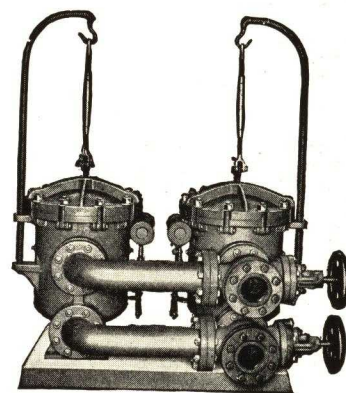


This provides double filtration through separated surfaces of an impregnated filter cloth made exclusively for this filter.

The upkeep expense and labor are reduced to a minimum, as the filtering media are used over and over again, and as there is no other part to deteriorate or reduce the filtering efficiency.

Available in single body and twin types in a wide range of capacities.

The twin unit at the right is for the filtration of very dirty raw water, or of condensation in plants operating continuously or with heavy peak loads. It consists of two complete filter bodies controlled by a single set of valves. One side is kept in service while the other is being cleaned, so no impurities pass during the cleaning period.

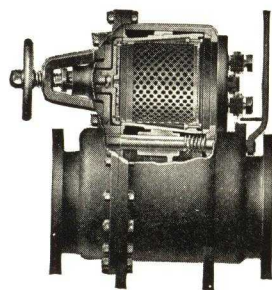


Twin Filter

We Furnish Filter Stockings for All Types of Filters

MULTI-DUCT STRAINER

For removing solid matter from water, oil and other liquids. Used for general supply and power plant purposes. Special wire cloth linings adapt it to special services on dyes, brine, swimming pool water, etc. Can be cleaned without interruption of service. Large straining area results in long operation before cleaning is necessary. Small space required. Can be mounted in any position. *Baskets cannot spill contents.* Internal parts made of bronze for long wear.



Strainer Basket in Position for Removal and Cleaning

Construction and Operation—Consists of three or more cylindrical strainer baskets securely held in bell-shaped conduits, spaced in a cylindrical plate and secured in a frame keyed to a central shaft. *Two baskets are continuously in service while the third is in cleaning position.* Baskets are rotated by moving a lever one-third turn, fixed by a stop, to bring the fouled baskets successively into position for cleaning. One turn of the hand wheel closes the valve disc against one end of the conduit, forcing the conduit to seat and completely shutting off each basket as it is to be cleaned. The cover is opened and the basket removed by a rod and plate device, which prevents the basket from spilling. This plate, when not in use, is secured against the face of the valve disc.

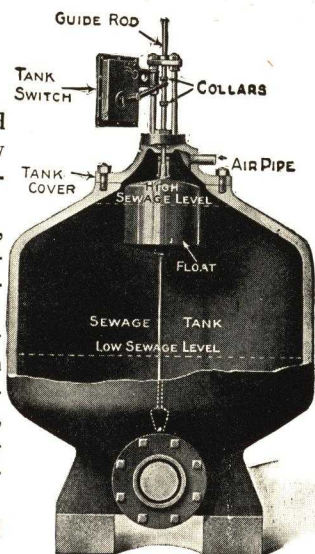
PNEUMATIC SEWAGE EJECTOR

For raising, by compressed air electrically controlled, raw sewage, sludge and liquids bearing solids.

Simple and rugged, insuring, in both design and construction, successful operation without maintenance trouble.

The control of the injector makes possible the installation of either a reciprocating compressor with air receiving tank, a directly-connected rotary compressor or other already available compressed air supply.

Furnished in all capacities and for all lifts.



Sectional View of Collecting Tank

◆ Individual Bulletins Furnished on Request ◆

BLACKBURN-SMITH PRODUCTS HAVE BEEN USED SUCCESSFULLY FOR OVER 20 YEARS

CONDENSER SERVICE & ENGINEERING CO., INC.

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Power Plant and Marine Auxiliaries and Oil Refinery Equipment

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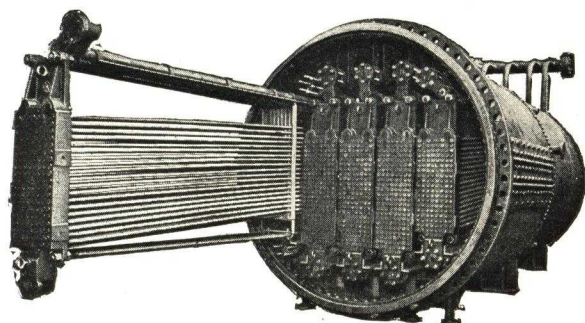
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Evaporators for Boiler Feed Make-up

G-R Evaporator Systems make any source of salt or impure raw water suitable for boiler feed make-up. Im-

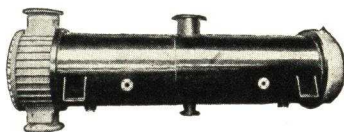


purities are removed by distillation and no chemicals are required. These systems pay for themselves in 12 to 18 months' operating time by eliminating boiler scale and boiler blow-down, decreasing boiler maintenance and repair expense, permitting heavy overloads on the boiler without danger of priming, and reducing coal and labor costs. Serving over 12,000,000 boiler hp. on shipboard, in central generating stations, and in industrial plants. The G-R Reducing Valve Evaporator System affords important economies in plants using large quantities of steam for process work.

An exclusive advantage of G-R Evaporators (Reilly and Bentube designs) is their patented scale-shedding feature which cracks up and flakes off scale accumulations by means of "thermal shock" and without requiring hand-cleaning of the evaporator coils or tubes. Furnished in horizontal and vertical types and for a wide range of pressures and capacities.

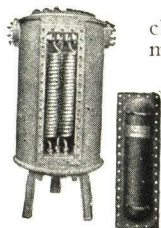
Extraction Steam Heaters for Boiler Feed

Heat boiler feed by means of steam bled from the main or auxiliary turbines in a closed heating cycle. Special design assures close temperature difference and low pressure drop. Built for high working pressures and has fully removable tube bundle and floating head.



Water Heaters

The well-known Reilly Heater is the pioneer closed water heater and the most efficient on the market. Widely used for boiler feed heating and general water-heating service in industrial plants and buildings because of its instantaneous heating effect, large overload capacity, and low maintenance cost. The crimped helical coils of seamless drawn copper tubing take up all expansion strains. All joints can be inspected and made tight while under pressure and without breaking steam or water connections.



We also manufacture other types of instantaneous water heaters.

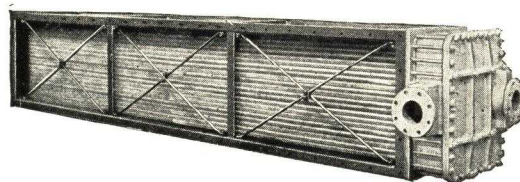
Fuel Oil Heaters

Twin G-Fin Heater for preheating fuel oil before it is fed to the burners. Finned surface provides exceptional heating effectiveness.



Generator Air Cooler

K-Fin Air Cooler cools air from generator windings in a closed system that excludes dust and moisture and elimi-



nates fire hazard. Cooling is effected by circulating raw water or turbine condensate through tubes surrounded by closely spaced fins which effectively conduct heat from the air passing over them.

Heat Exchangers

G-R Multiwhirl Cooler, for cooling turbine lubricating oil, transformer oil, or oil engine jacket water, has patented helical baffle which assures effective heat transfer without excessive pressure drop of liquid passing through shell.

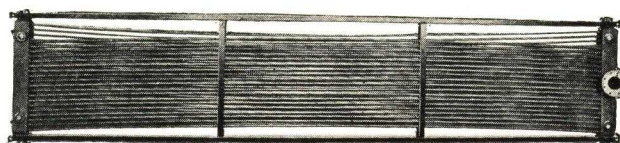
Right:

G-R
Multiwhirl
Cooler



G-R Vaneflo Condenser, Heat Exchanger or Cooler, for vapors, gases and liquids in chemical plants, petroleum refineries, etc. has patented Vaneflo baffle which provides minimum pressure drop. Spacing of baffles determined by fluid passing through shell.

G-R Bentube Section maintains cooling or condensing capacity with poor quality of cooling water because of patented scale-shedding action which continuously flakes off scale accumulations from tubes. Furnished for atmospheric or submerged duty.



G-R Bentube Section

G-R Tubeflo Section maintains initial cooling effectiveness with dirty liquids or gases because straight tubes for both hot and cold fluids and high velocity of flow keep passages clean. Special materials used for corrosive liquids.

G-Fin Gas Cooler has finned tubes which provide maximum cooling effectiveness for gases or vapors by greatly increasing the heat transfer surface on the outside of the tubes.

Expansion Joints

For use on the turbine exhaust connection to the condenser to provide for expansion and contraction. Sold on definite flexibility guarantees.

Other Products

We also manufacture Air Preheaters, Open Feed Water Heaters, Three-way Valves, Tank Liquid Level Controllers, Small Water-Distilling Sets, Grease Extractors, Steam and Air Separators, etc.
Bulletins describing G-R Apparatus sent on request.

HANCOCK AND METROPOLITAN INJECTOR DIVISION

CONSOLIDATED ASHCROFT HANCOCK COMPANY
INCORPORATED

BRIDGEPORT, CONN.

AMERICAN SCHAEFFER & BUDENBERG DIVISION
CONSOLIDATED SAFETY VALVE DIVISION

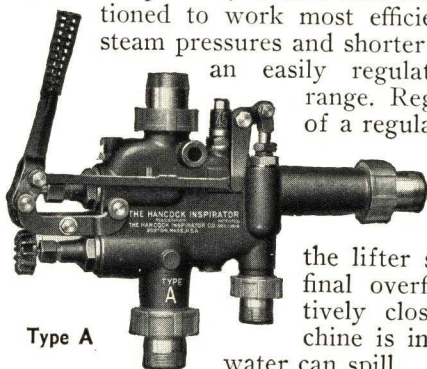
ASHCROFT AMERICAN GAUGE DIVISION
HANCOCK VALVE DIVISION

THE HANCOCK INSPIRATOR AND METROPOLITAN INJECTOR

The jet apparatus shown on this page is the result of 55 years' experience in making the highest grade inspirators, injectors and ejectors. Our development and engineering staffs, testing laboratories and manufacturing facilities enable us to produce these machines of established efficiency to meet exacting, present-day requirements. Bulletin No. 100.

Hancock Stationary Type—The Hancock Stationary Inspirator is the simplest form of double tube machine. For general all-around service it has no equal. Its operation is the same for all conditions within the scope of its wide working range, no adjustments being necessary for varying steam pressures.

Hancock Type A—The tubes and nozzles of this one-lever operated, double-tube machine are proportioned to work most efficiently at the higher steam pressures and shorter lifts. This affords an easily regulated wide capacity range. Regulation is by means of a regulating valve which is



Stationary Type

located directly beneath the lever. It controls the flow of steam to the lifter steam nozzle. The final overflow valve is positively closed when the machine is in operation, and no water can spill.

Metropolitan Double Tube Injector, Model O—Similar to the Hancock Type A except made in smaller and larger sizes from 1/2 to 3 in. inclusive, with capacities from 140 to 5800 gal. per hour.

Metropolitan Automatic, Model N—This single tube automatic or restarting Metropolitan Injector is

self-contained. It is operated entirely by one handle, not requiring valves in the steam or suction pipe to be regulated for different steam pressures.

This injector is self-starting after interruption of steam or feed water supply.



Metropolitan Automatic—Model N

CAPACITIES AND PIPE SIZES

Size No.	Weight, lbs.	Pipe connections, in.			Gal. per hour
		Steam	Suction delivery	Overflow	
Stationary Type					
7½	3¾	¾		¼	60
8¾	4½	¾	½	¾	90
10	4½	¾	½	¾	120
12½	6¾	½	¾	½	220
15	6¾	½	¾	½	300
17½	9¾	¾	1	¾	420
20	9¾	¾	1	¾	540
22½			1¼	1	720
25	16	1	1¼	1	900
30	16	1¼	1½	1¼	1260
35	22	1¼	1½	1¼	1740
40	25	1½	2	1½	2230
45	32	1½	2	1½	2820
50	54	2	2½	2	3480
55	62	2	2½	2	3650
Type A					
25	35	1¼	1¼	1¼	1020
30	40	1¼	1¼	1¼	1430
35	40	1½	1½	1½	1875
40	58	2	2	1½	2530
45	58	2	2	1½	3200
50	74	2	2½	1½	3950
55	74	2	2½	1½	4140
Metropolitan Automatic—Model N					
2	2½	¾	¾	¾	60
3	2½	¾	¾	¾	80
3½	3	½	½	¾	120
4	3	½	½	¾	165
5	5	¾	¾	1	250
6	5	¾	¾	1	350
7	8	1	1	1¼	500
8	8	1	1	1¼	600
9	12	1¼	1¼	1½	800
10	12	1¼	1¼	1½	1000
11	20	1½	1½	2	1300
12	20	1½	1½	2	1750
13	32	2	2	2½	2300
14	32	2	2	2½	2850

Notes: A suction coupling and a flat strainer are furnished with each Stationary Inspirator in sizes from 7 1/2 to 25 inclusive. A flat strainer is furnished with each Model N Injector in sizes from 2 to 10, inclusive.

THE HANCOCK EJECTOR

For handling water or other liquids, or for moving air, with steam, water or air as the motive power. They are used instead of mechanical pumps on account of low cost and simplicity of operation.



The Hancock Ejector

All Hancock Ejectors will take feed water at a maximum temperature of 180° F. This high temperature is possible only when the water flows to the ejector, and

the elevation above the ejector does not exceed 6 ft., and the steam pressure necessary is from 25 to 40 lb.

Size No.	Wt. lb.	Pipe connections, in.		Gal. per hour 60 lb. steam pressure
		Steam	Suction and delivery	
1-bronze	7 7/8	1/4	1/2	240
2-bronze	1 3/8	3/8	3/4	550
3-bronze	2 1/8	1/2	1	975
4-bronze	3 1/4	3/4	1 1/4	1,525
5-iron	5 1/2	3/4	1 1/2	2,200
6-iron	9 1/2	1	2	3,900
7-iron	15	1 1/4	2 1/2	6,000
8-iron	20	1 1/2	3	8,800
9-iron	34	2	4	15,600
10-iron	52	2 1/2	5	24,000
11-iron	75	2 1/2	6	35,000

ESTABLISHED 1883

THE NATIONAL PIPE BENDING CO.

Hot Water Heaters, Oil Separators; Coilers of Pipe and Tubing
131 River Street, NEW HAVEN, CONN.

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Products

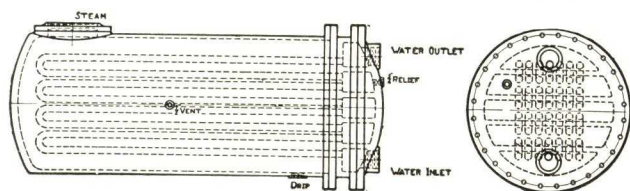
INSTANTANEOUS HEATERS (Bulletin No. 55); WATER STORAGE HEATERS (Bulletin No. 68); FEED WATER HEATERS (Bulletins Nos. 51A and 53); OIL SEPARATORS; COILS, PIPE and TUBE (Bulletin No. 60).

Also Caustic Liquor Heaters and Fuel Oil Heaters designed to suit service.

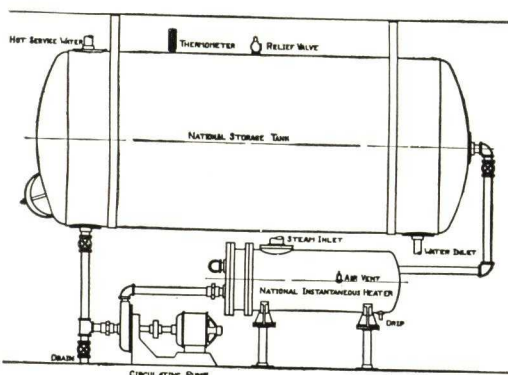
National Hot Water Heaters

We make hot water heating units of two types, instantaneous and storage. Both types have their advantages and the installation depends upon the hot water demand. For either exhaust or live steam.

Instantaneous Type—Heats water as it flows either continuously or intermittently. Built for steam pressures up to 75 lb. per sq. in. U-bend copper tubes through which the water passes are fitted into a cast iron or steel shell through which the steam for heating is passed. Made in sizes from 210 to 12,000 gallons of hot water per hour at temperatures from 40° to 180° F.



Instantaneous Process Water Heater
One of our three styles of tube elements



Instantaneous Process Water Heater, Pump and Storage Tank

National Horizontal Oil Separator

Insures complete separation of oil and exhaust steam, yet allows steam to pass through freely without friction. Oil is taken out of the current of steam by gravity, impact and change of direction, and baffle plates prevent it from being picked up again and carried along in the current. At the bottom a large drip opening leads from the storage chamber for draining the separator to the sewer.

These separators are made in two pieces to allow inspection and test of baffle plates. Joint is machined and guaranteed perfectly tight.

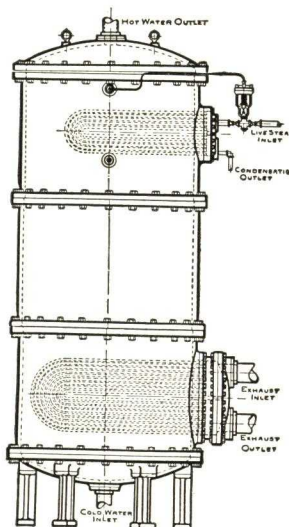
The steam, when condensed, is perfectly suitable for boiler feed, laundry or dyehouse service, ice making or any other similar purpose.



Oil Separator

Feed Water Heaters

National Feed Water Heaters are made up of a cast iron, wrought iron or steel shell containing one or more helical coils of seamless copper tubing. The water is pumped through the coils absorbing heat from the exhaust steam in the shell. These heaters are made in sizes to provide for heating the feed water for a wide range of boiler sizes and invariably show large savings of fuel.



Vertical Storage Heater, Double Element

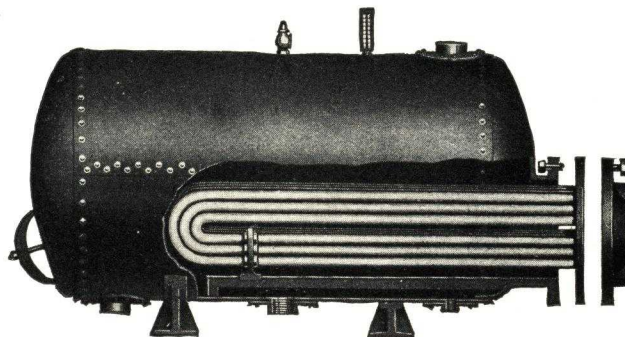
instances. Made in horizontal and vertical type to supply from 100 to 15,000 gallons of hot water per hour, heated through standard temperature range 50° to 180° F., with steam under pressure from 0 to 100 lb. gauge.



Original Coil Type Heater
Inside manifold. A type that has been in use over 40 years

Single and Double Element Storage Heaters

A combination of a closed pressure vessel and a steam tube heating element. For use under conditions where the instantaneous demand for hot water exceeds the immediate steam supply. A properly proportioned hot water storage heater will insure ample hot water without increased boiler capacity in many



Single Element Steel Shell Horizontal Storage Heater

Note the ease with which element can be removed. These heating elements can also be supplied separately for heating tanks, vats, and flowing liquids in pipes

Facilities for Coils and Bends

THE NATIONAL PIPE BENDING CO. is prepared to submit designs, specifications and estimates for any requirements. All "National" Coils are continuous, without couplings, or screwed fittings, unless specified. Iron and steel coils have electrically welded joints; brass and copper, brazed joints.

SCHUTTE & KOERTING COMPANY

MAIN OFFICE AND WORKS

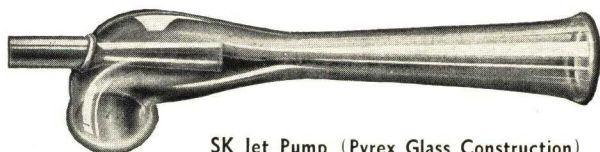
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Branch Offices and Sales Agents in All Leading Cities

Jets

SK Boiler Feed Injectors—Double tube construction for all capacities and pressures. High suction lift and high discharge pressure. Handle hot water.

SK Jet Pumps—For handling liquids, vapors and gases by means of water, steam or air jets. Used as mixers, agitators, blenders, emulsifiers, circulators. Suitable for suction lifts up to 28 ft. and any desired discharge head.



SK Jet Pump (Pyrex Glass Construction)

SK Jet Heaters—Direct contact type. Can be used to pump while heating. Noiseless and recirculating types. "Continuous" type for direct insertion in steam and water lines.

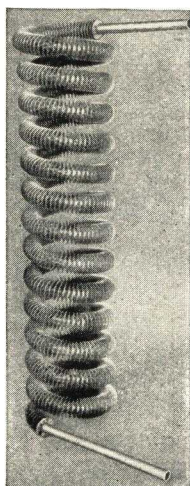
SK Pump Primers—Operate by means of steam, water and air jets to prime pumps for any suction lift up to 30 ft.

SK Thermo Compressors—Operated by means of a steam jet and used for recompressing and reusing exhaust steam otherwise wasted.

SK Obnoxious Vapor Condensers and Fume Absorbers—Water spray type. Create their own draft. Used as dust collectors and gas scrubbers. Produce high degree of odor or solid removal at low operating cost.

SK Desuperheaters—For reducing and controlling steam superheat. Spray and surface absorption types. Furnished together with pressure reducing and controlling equipment as integral steam temperature and pressure control stations.

SK Spray Nozzles and Atomizers—Built to produce any shape of spray and any capacity. Suitable for coarse spray, fine spray, or mist atomization. Made of corrosion-resistant alloys when required.



SK Radiofin Coil

Heat Transfer Apparatus

SK Heat Exchange Equipment—Includes feed water heaters, evaporators, oil coolers, oil heaters, generator air coolers, compressed air after-coolers, jacket water coolers. Plate type exchangers of lead, stainless steel, or other alloys for chemical plant service.

SK Radiatin Tubes—Extended surface finned tubes. For air heating and air cooling units. Any size up to 12-in. diameter and 15-ft. length. Any pressure. Special shapes.



Vacuum Equipment

SK Jet Condensers—Barometric and low level type. Vacua up to 29 in. without air pumps. Specially designed water jets entrain air and non-condensable gases while condensing steam. Low terminal temperature difference.

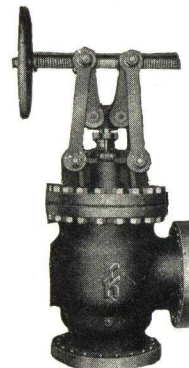
SK Vacuum Pumps—Steam and water jet type or combination for any degree of vacuum up to 1 millimeter absolute pressure.



Hydro-steam Vacuum Pump

Valves

SK Valves—Include all sizes for any class of hydraulic or steam service. High pressure heavy duty non-return valves, reducing valves, and throttle valves. Everdur and other corrosion-resistant alloy valves and fittings for chemical service. Bleeder valves, atmospheric relief valves, back pressure valves, altitude valves, solenoid valves, seatless valves, automatic trip throttle valves and automatic engine stop systems.



SK 1400-lb. Valve

General Equipment

SK Lead Fans and Lead Centrifugal Pumps—For chemical plant service. Centrifugal pumps also built in Everdur, Ilium and other corrosion-resistant alloys.

SK Strainers—Single and double basket type for oil, water, steam. Also grease extractors.

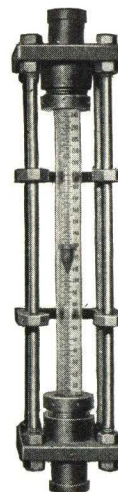
SK Water Level Televisors—Used to give distant indication of boiler water level. Electrically operated. Contain no mechanical moving parts and no mercury in contact with boiler water.

SK Oil Burning Systems—Mechanical pressure atomization type for boiler installations. Also steam and air atomizer types for kilns, furnaces, etc. Complete with all accessories and automatic control.

SK Rotameters—Area type flow meter for accurate flow readings. Especially suitable for chemical plant service. Also flow indicators of single or double glass type.

SK Gear Type Rotary Oil Pumps—Pressures up to 1500 lbs. Capacities up to 1000 g.p.m. Patented gear tooth construction for high mechanical efficiency. High speed design for direct motor connection.

SK Oxygen Bombs—For making aging test on rubber and similar materials.



SK Rotameter

THE WHITLOCK COIL PIPE COMPANY

Heat Transfer Equipment
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Manufacturers of and Sales Agents for Whitlock Heaters in Canada:
DARLING BROS., LTD., 120 Prince Street, MONTREAL

Products

Engineers and manufacturers of WHITLOCK HEAT TRANSFER EQUIPMENT including: Closed Feed Water Heaters; Water Heaters and Coolers; Fuel Oil Heaters; Heat Exchangers for heating and cooling liquids, vapors and gases; Preheaters; Coils and Bends of all sizes made from iron, steel, copper and brass pipe and tubing; Welded Receivers; Pressure Vessels.

Bulletins

Bulletins illustrating and describing the design and construction of these products will be gladly sent to anyone interested. When writing describe your problem as completely as possible so we can be sure we are sending the correct information.

Whitlock Heat Transfer Equipment

(Write for Bulletin 100)

Whitlock Heat Transfer Equipment is designed to heat or cool any liquid, gas or vapor while cooling or heating another liquid, gas or vapor. It is designed and manufactured in many

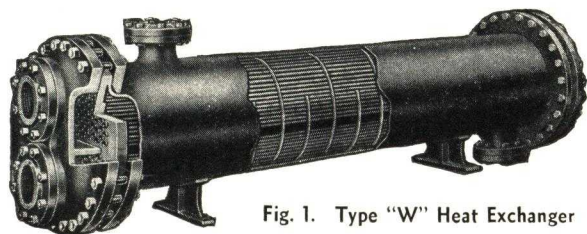


Fig. 1. Type "W" Heat Exchanger

different types, each of which has its particular adaptations. There is no space available to even briefly describe or illustrate the many different designs which are available to meet such problems but the illustrations herewith will give an idea of a few of the special types of heat transfer equipment which have been designed and built by this Company.

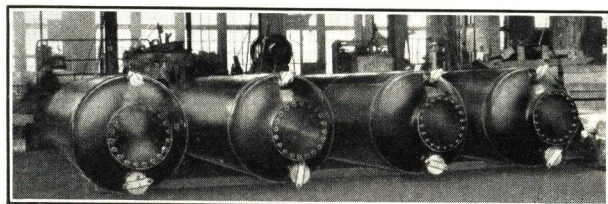


Fig. 2. Set of Steel Autoclaves—All-welded Construction

Whitlock Preheaters—for Reclaiming Waste Heat

(Write for Bulletins 50 and 55)

Reclaiming heat from waste wash water, dye liquors, and other hot liquids is a source of "income" overlooked in many plants. The possibilities are substantial and we will gladly make a survey of your plant conditions and tell you what you can save—and what it will cost to install the proper Whitlock Preheater to effect the saving.

WHITLOCK
HEAT TRANSFER
EQUIPMENT

In the open preheater (Fig. 3) the waste liquid is piped to the trench in which the preheater is installed. The liquid is properly directed, by baffles, so that it gives up its heat efficiently to the liquid within the tubes.

The preheater can be designed to recover a large percentage of the heat available.

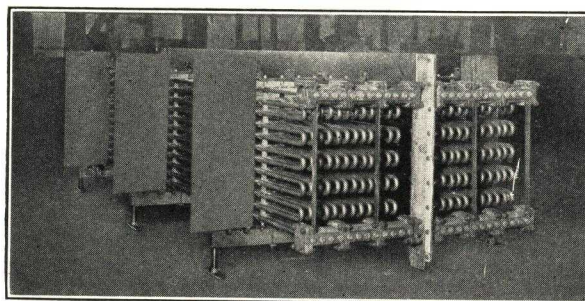


Fig. 3. Whitlock Preheater Unit—2 Stage—1932 Model—All Copper and Bronze Construction

In the closed type preheater the action is the same but the liquid flows through the shell of the preheater instead of through an open trench. The conditions of each particular installation govern the choice of the proper type of preheater.

Whitlock Feed Water Heaters

(Write for Bulletin 13)

The value of heating feed water is well recognized by all power plant engineers. The Whitlock "American Standard" Types A and B Feed Water Heaters, which we have made for over forty years, are serving thousands of industrial plants efficiently. These heaters are of the copper coil type. For low and high pressure extraction feed water heating we make heaters of the U-bend and straight tube, floating head, types.

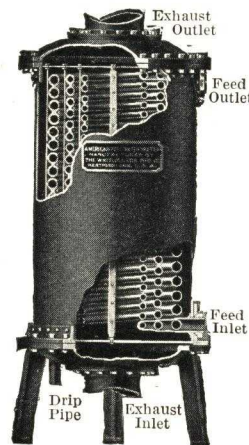


Fig. 4. Type "A" Standard Feed Water Heater

Storage and Instantaneous Heaters

(Write for Bulletins 40 and 25)

Whitlock Storage and Instantaneous Heaters are specified constantly by leading engineers for heating water for schools, office buildings, industrial plants, hotels, hospitals, and for swimming pools and hot water heating systems.

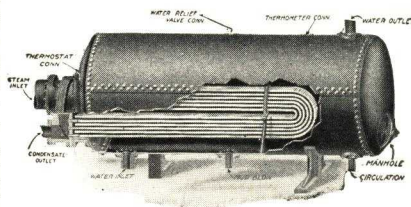


Fig. 5. Whitlock Type "K" Storage Heater

THE COOLING TOWER COMPANY, INC.

Manufacturers of Cooling Towers, Spray Nozzles, and Air Washers
15 John Street, NEW YORK, N. Y.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Atmospheric Cooling Towers

The amount of water circulated per square foot of active horizontal area (i.e. the area of one deck) affects the final temperature to which an atmospheric cooling tower will cool. For refrigeration use we recommend using 2 sq. ft. of active horizontal area per ton of refrigeration. For use with internal combustion engines we recommend 1 sq. ft. of active horizontal area for every 10 to 15 hp., depending on the cooling range required. For steam condensing service, it is not quite so easy to determine the size tower required. We must know (1) vacuum required in inches of mercury; (2) condenser differential; (3) amount of steam condensed in pounds per hour. Our Bulletin 303-S covers this subject thoroughly. We shall be glad to mail a copy on request.

Frame—Steel or timber diagonally braced for wind thrust to carry all loads with safety factor of 4. Our towers have passed the acid test of all recent cyclones.

Walkway and Ladder—Provide easy access to distributors.

Distributing System—Sprinkler type of patented construction. Guaranteed free from plugging.

Secondary Distributors—Used to prevent unnecessary icing of tower during winter use.

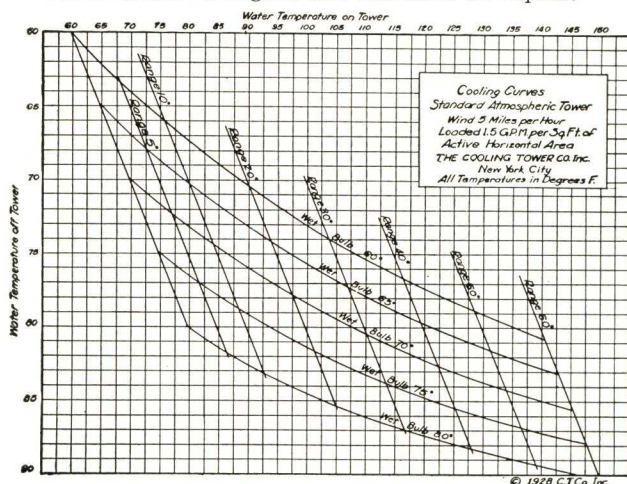
Decks—Patented sections; rigid alignment; warping or distortion prevented; uniform distribution of water; properly spaced.

Louvres—Wood or corrugated metal. Securely fastened; rigid construction.

Collecting Basin—8 in. deep, extends 1 ft. outside tower footings; fitted with discharge flange, suction head and strainer.

Lumber—Louisiana cypress, Virginia swamp cedar, or California redwood.

Substructure—Designed and furnished on request.



Standard Guarantee Cooling Curves

Guarantee—We make a curve guarantee for our standard atmospheric towers. When operating at a capacity of 1½ gal. per minute per sq. ft. of active horizontal area, they will effect temperature reductions as shown by the curves above. Our curves are based upon wet bulb temperatures taken with a sling psychrometer (used by the U. S. Weather Bureau) or other approved mechanically ventilated wet bulb thermometers.

Cooling Results—For cooling results when tower is loaded to 2¼ gal. per sq. ft. of active horizontal area see Bulletin 303-S.

Ornamental Cooling Towers

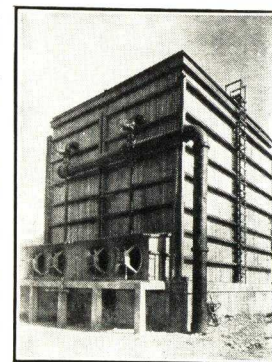
By adding ornamental pilasters and cornices to our standard towers we can make them conform to the architectural design of the building at slight additional cost.

Mechanical Draft and Chimney Type Towers

We fabricate, erect, and guarantee forced and induced draft cooling towers of any capacity and of any suitable materials, also combined atmospheric and chimney towers, together with straight counter-current chimney towers.

Our forced draft towers can be equipped with multiple-disc or airplane type fans, according to the requirements covering air delivery, pressure, and silent operation.

Our Bulletin 286-S describes the above types of towers and contains cooling curves showing results at different loadings.



Spray Nozzle Systems

We make two types of spray nozzles. Our Impact spray nozzle throws a flat, fan-shaped spray cloud. Our Spirodome spray nozzle produces a high conical spray cloud suitable for general installations.

Either type may fit the requirements and our Engineering Department will be glad to submit suggestions and proposals covering the right type for your purpose.

Outstanding features of our spray pond systems are:

- (1) Non-clogging nozzles.
- (2) Freedom from interruption of operation.

(3) Automatic drain and flush-out valve.

(4) Well designed spray fence for protection against spray drift. Send for Bulletin 302-S.

SPRAY NOZZLE DATA

Nozzle No.	Pipe size, in.*	Pressure in lb. per sq. in.		
		5	7	10
		Cap. in U. S. gal. per min.		
Impact Type				
60	2	53.0	62.5	74.5
50	2	44.0	52.0	62.0
45	2	40.0	47.0	56.0
40	2	35.4	42.0	50.0
35	2	30.8	36.4	43.5
30	1½	26.2	31.0	37.0
25	1½	22.0	26.0	31.0
20	1½	17.5	20.8	24.8
15	1½	13.0	15.5	18.5
10	1½	8.7	10.4	12.4
8	1	7.0	8.3	9.9
5	1	4.4	5.2	6.2
4	¾	3.5	4.1	4.9
3	¾	2.6	3.1	3.7
2	¾	1.7	2.1	2.5
A	¾	1.3	1.55	1.86
B	¾	.95	1.12	1.35
Spirodome Type				
39	2	33.8	40.0	47.7
24	1½	21.1	25.0	29.9
19	1½	16.9	20.0	23.9

*For which nozzle is threaded.



Impact Air Washers

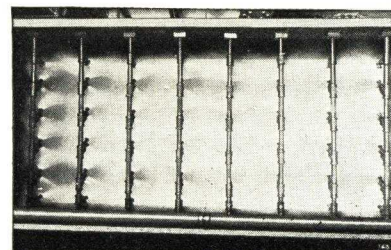
Our Impact air washers remove 95% of the dust and leave no free moisture. Their outstanding features are:

(1) Automatically cleaned without shutting down for washing.

(2) Lead antimony eliminator plates.

(3) Heavy construction; no flimsy screens.

(4) Venturi throat does away with water on floor. Completely described in Bulletin 287-S.



THE FLUOR CORPORATION LTD.

Manufacturers of Fluor Aerator Cooling Towers

909 East 59th Street, LOS ANGELES, CALIF.

KANSAS CITY, MO., 607 Linwood Boulevard
NEW YORK, N. Y., 220 E. 42nd Street
WASHINGTON, D. C., Barr Building
TULSA, OKLA., 1407 Philtower Building

BRANCH OFFICES

OKLAHOMA CITY, OKLA., 1639 W. Main Street
CHICAGO, ILL., 57 W. Jackson Boulevard
HOUSTON, TEX.
ST. LOUIS, MO., 4215 Lindell Boulevard

The Company

THE FLUOR CORPORATION, established in 1890, for the past 12 years has aggressively engineered important changes into the atmospheric cooling tower field. A constant search for improvements down to the finest details of construction has earned for the Fluor organization the reputation of leadership and consistent engineering progress.



Trained Field Force Maintained

Trained erectors in addition to complete division offices are maintained by the company in many parts of the country. All parts are factory fabricated and may be quickly assembled and erected at the site. Rapid shipment of complete towers is assured by large stocks of standard fabricated parts and hardware.

NEW, IMPROVED FLUOR VERTICAL AERATOR-TYPE COOLING TOWER

This new structure is offered to industry as a thoroughly proved, highly efficient, economical cooling system.

Advantages of Fluor Cooling Towers—(1) Elimination of wind blown spray. (2) Uniform distribution top to bottom. (3) Positive low pressure distribution. (4) Full cooling under all conditions. (5) Uniform minimum width regardless of height. (6) Extension upward without added ground area. (7) Aerator-type perfected in the field. (8) Conversion from louvers to aerators easily and quickly made.

Built of California Redwood—This wood possesses strength, durability, is non-inflammable, of low first and maintenance cost. Fluor Cooling Tower frame members, aerators, decks, distributors, stairs, walks, rails, etc., are of California redwood.

In addition all Fluor Towers are fitted throughout with brass, copper or galvanized hardware.

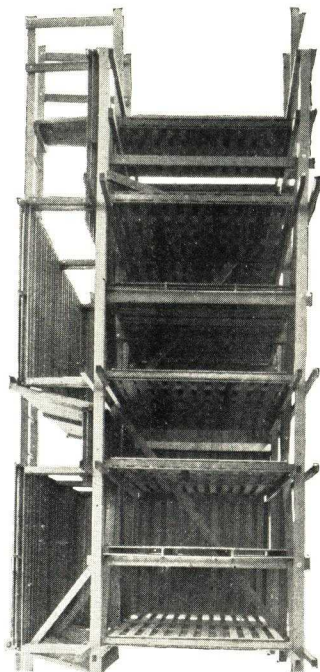
Principles of Economy and Efficiency—Sturdy framework is of three-post construction and rigidly cross-braced and adequately sway

braced. Entire framework is bolted. Self-supporting under wind pressure of 30 lbs. per sq. ft.

The distributing system is of low pressure (1½ lbs. or less), non-clogging type, insuring uniform distribution which does not depend on pressure or splash but merely a covering of specially designed primary deck surfaces. Cooling decks are of patented, double staggered, bowed, wide panel type. Space between two battens in upper row is covered by one in lower row, thus continually redistributing the water.

No Loss of Water by Wind—Changes of direction and direct contact with unsurfaced baffles separate water particles from air. The offset space between each unit admits air on windward side and allows humid air to escape on lee side. Water distribution is never disturbed nor spray carried through tower. Cooling performance is uniform.

Standardization—Aerators are standard on all Fluor Towers from 5 gals. per minute upward. Towers for use with atmospheric cooling coils of all types are also standard.



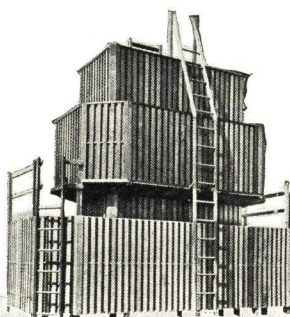
Inside View of Standard 12-ft. Wide Fluor Tower

Showing details of frame work, deck supports, decks, aerators, drip panels, etc.

At Right:

Model of a Fluor Coil Type Tower

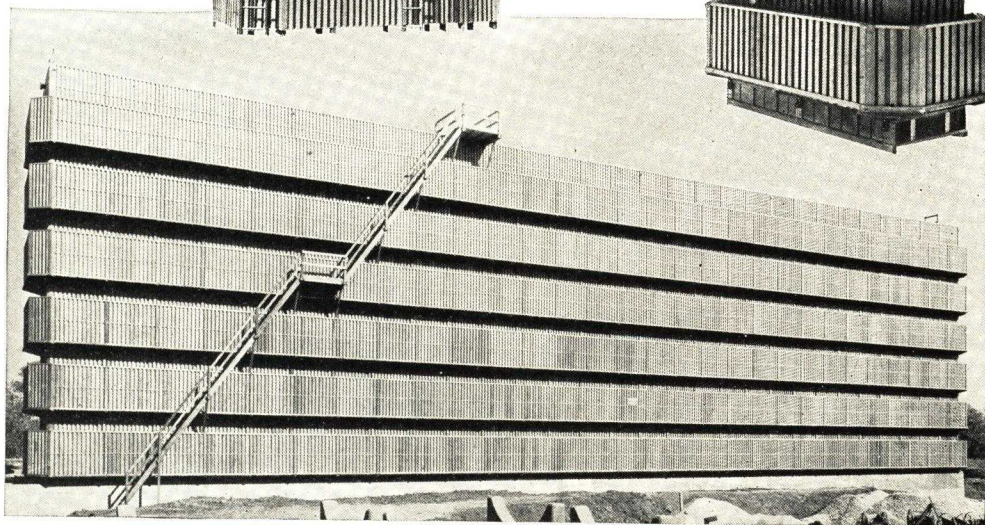
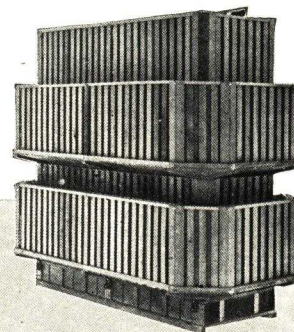
Showing sub-structure and three decks above. Note the construction of the aerator



At Right:

Small Fluor Tower in Redwood Basin

Aerator construction is incorporated in all sizes of towers.



The New Improved Fluor Vertical Aerator-Type Cooling Tower

Operates efficiently under all weather conditions and meets the most rigid space requirements

SCHUBERT-CHRISTY CORPORATION

TELEPHONES
Swifton 6701, Watson 6711

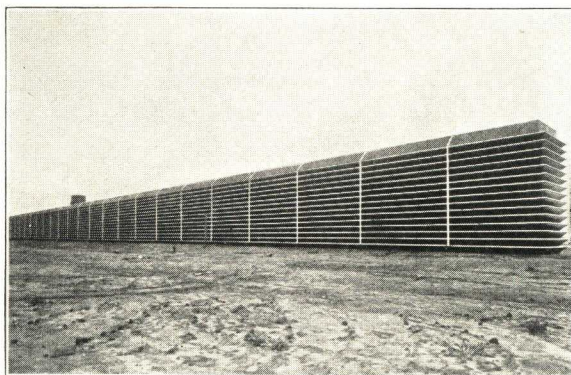
Box 567, AFFTON, MO.

CABLE ADDRESS
"Chrisbert"

Products

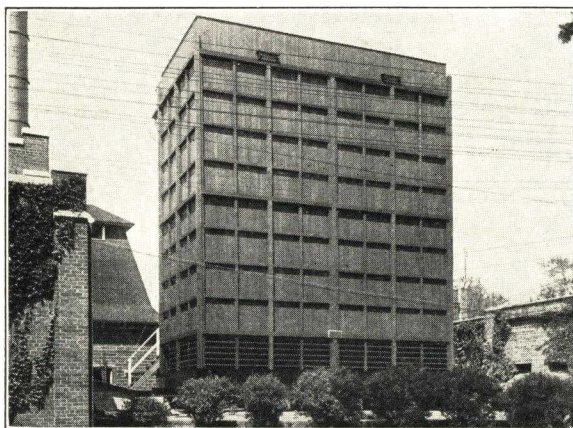
"SCHUBERT-CHRISTY" ATMOSPHERIC TOWERS.
"SCHUBERT-CHRISTY" FORCED DRAFT TOWERS.
"SCHUBERT-CHRISTY" INDUCED DRAFT TOWERS.
"SCHUBERT-CHRISTY" COMBINATION DRAFT TOWERS.
Also "Hi-Spra" Spray Nozzles; Solid Aluminum Airplane Type Fans.

Schubert-Christy Cooling Towers



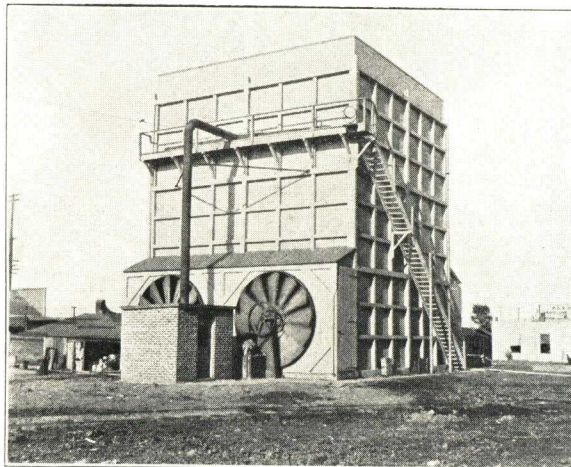
Atmospheric Type

Atmospheric Type—Combines maximum efficiency with best appearance and general utility. Water is cooled through moderate temperature ranges to within a few degrees of existing wet bulb temperature. Deep louvers and gravity water distribution are standard equipment. Arranged for installation upon ground, roof of building, elevated steelwork, or other suitable location.



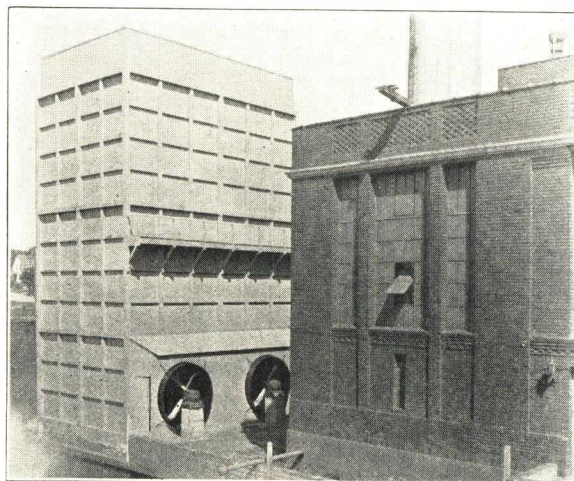
Induced Draft Type

Induced Draft Type—In this type of tower the fans operate in a horizontal plane at the top of the tower. This construction has many inherent advantages over the ordinary mechanical draft types. The fans handle only the warm exhaust air, eliminating the danger of ice forming on the blades during winter operation. Noises caused by the operation of the fans are thrown upward, effectively quieting all fan noises. The actual air velocity through the tower is very low, preventing shattering of the water raining through the tower. The result is a cooling tower exceptionally free from drift loss. Because the fans are placed above the filling, fan houses are unnecessary thus simplifying the foundation, reducing space required, lowering pumping head and improving the appearance of the cooling tower. Fans are driven by multi-speed motors equipped with remote control which enables the operator to select the proper speed for any load or weather condition, with a corresponding saving in operating cost.



Forced Draft Type

Forced Draft Type—Are distinguished by extremely low distance from top of foundations to center line of warm water inlet. Relatively large quantities of water cooled through a large temperature range to within a moderate degree of wet bulb temperature. Either airplane type propellers or disc type fans used. This design possesses great strength and is very compact.



Combination Type

Combination Forced and Natural Draft Type—This type is similar to the forced draft type, except that its capacity is slightly greater and that it can be operated without fan power during a large portion of the year. Heavy framework and carefully developed construction details insure great strength as well as long life. Large natural draft air inlets are provided so that fans may be shut down during colder months of the year, resulting in considerable saving of fan power.

Materials and Workmanship

Schubert-Christy cooling towers are constructed of either genuine Tidewater red cypress, redwood, steel or concrete, to best meet conditions. Carefully selected timber, specially treated with wood preservative of high penetrating power, is used in construction of cypress or redwood towers. All metal parts are thoroughly rust-proofed. Splash plates, water distributors and similar interior parts, where exposed to action of water, are of bakelite, pure copper, aluminum, lead, bronze, or other non-ferrous composition. Towers are proportioned and equipped to operate successfully under most adverse weather conditions, under sustained overload periods and with waters containing solids, acids or alkali.

Complete specifications, including blueprints and photographs, submitted with each proposal.

POWER PLANT PIPING

. . .

VALVES

THE M. W. KELLOGG COMPANY

225 Broadway, NEW YORK, N. Y.

WORKS, JERSEY CITY, N. J.

BRANCH OFFICES

CHICAGO, ILL.

TULSA, OKLA.

LOS ANGELES, CAL.

BOSTON, MASS.

BIRMINGHAM, ALA.

CANADIAN KELLOGG CO., LTD., MONTREAL, TORONTO, WINNIPEG, CAN.

Kellogg "Masterweld" Products

DESIGN, FABRICATION and INSTALLATION of complete piping systems for Central Station and Industrial plants; "MASTERWELD" RECEIVERS, SEPARATORS, RECEIVER-SEPARATORS, and HEADERS, BOILER DRUMS, AUTOCLAVES.

Special bends of plain or corrugated construction. All standard types of joints such as the Van Stone, double groove, tongue and groove and Sarlun.

Kellogg welded products comply with the A.S.M.E. Boiler Construction Code.

For Kellogg Perforated Radial Brick Chimneys, see Manufacturers' Index.

Kellogg Seamless Rolled Steel Cylinders

Joined by the "Masterweld," these cylinders produce a pressure vessel free from longitudinal seams, with all fibers running circumferentially, and having corrosion resisting "skin" of rolled steel. They have properties equivalent to those of a solid forged vessel, yet can be fabricated with markedly more economy. Seamless cylinder fabrication is an exclusive Kellogg process. Vessels produced in sizes 36 to 156 in. I.D., with a wall thickness of 3 in. at the larger diameter.

Kellogg "Masterweld" Receivers, Separators and Headers

Designed to avoid structural weakness of earlier types and to provide an absolutely tight structure at all times.

High grade, open hearth welding quality steel used throughout and especial care taken in heat treatment to insure all strain removal. Vessel is unaffected by expansion and contraction and when finished is lighter than a riveted or cast vessel of same capacity.

Guaranteed for super-heated steam at any practical pressure at temperatures up to 900° F.



Reaction Chamber of Kellogg "Masterweld" Seamless Rolled Cylinders

Pressure Vessels

The Kellogg "Masterweld" process is admirably suited to the fabrication of pressure vessels free from longitudinal welds for the Petroleum and allied industries, to meet the very high pressures and temperatures, such as: reaction chambers, evaporator towers, bubble towers, and kindred vessels. Sizes limited only by transportation facilities.

Kellogg Complete Piping Systems

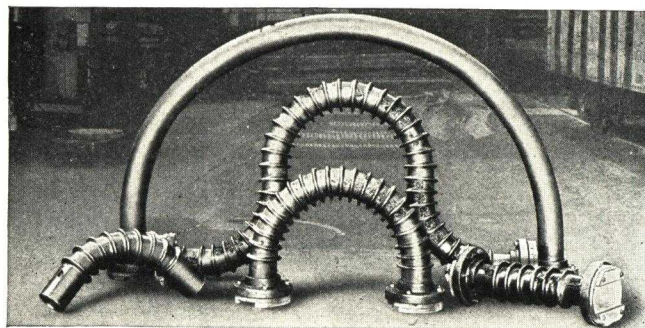
Central Station and Industrial Plant Engineers are invited to submit their problems to Kellogg Engineers for proposals covering complete piping work. Permanent performance and satisfaction guaranteed.

Pipe Joints

The Van Stone joint can be furnished in 100%, 150% and 200% lap thickness, and the tongue and groove joint up to 200% of nominal pipe thickness. The Van Stone is an eminently satisfactory joint for medium pressures, and with such modifications as the double groove or Sarlun type joint is suitable for any of the pressures now generally used.

Either the double groove, Sarlun or the Van Stone joint are full machined to rigid tolerances.

The double recess joint is of entirely new and improved simplified construction, especially designed for small piping, such as high pressure drips.



Corrugated Bends of Kellogg "Masterweld" Pipe

Corrugated Pipe Bends and Tangents

Eliminate excessive joint stress and permit maximum runs of piping, with a flexibility of from 3 to 5 times that of a plain bend or tangent. Much lower stresses are imposed on a joint with an increase in expansion allowance. Available in all economical sizes.

Kellogg "Masterweld" pipe or seamless tubing is used exclusively.

Kell-Raph Gaskets

Seamless steel rings, plated with copper, silver, gold, platinum or any other soft metal that will resist the action of the fluid to be handled. They produce a high unit gasket pressure, the steel core withstanding the stress and the soft plating metal providing the yielding properties necessary for joint tightness. The steel core being of approximately the same analysis as the pipe materials, expands and contracts at the same rate.

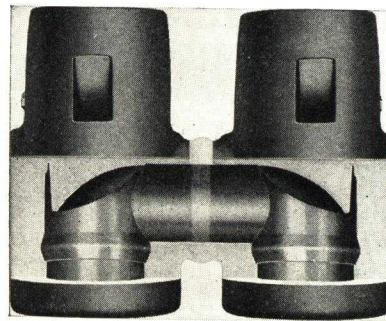
The gaskets can be used over and over again indefinitely. They suffer no impairment when the joint is broken. Furnished in various types, in sizes 1 to 24 in. for pressures up to 2000 lbs. per sq. in.

Kellogg "Smooth-Flow" Return Headers

Furnished in all standard sizes in regular carbon steel or of 4/6% chrome with .5% molybdenum or 1% tungsten. This choice of steels covers practically all header requirements of the oil and process industries.

Body is entirely of forged material with the consequent soundness, toughness and reliability commonly found in a forging.

Inquiries should include data on furnace tube diameter, center to center dimensions of tubes and material preferred.



Kellogg "Smooth-Flow" Return Header

Scope of Kellogg Service

The Kellogg engineering personnel possesses expert knowledge of the most advanced practices and design of piping systems.

Back of the engineering service is the Kellogg modern manufacturing plant, located at tide-water convenient to ocean and land transportation, making direct loading possible, and equipped for fabricating all orders, small or large, quickly and accurately.

Literature

Literature giving more complete details of the various Kellogg products will be sent on request.

PITTSBURGH PIPING & EQUIPMENT CO.

Piping Manufacturers and Contractors

43rd Street and A. V. R. R., PITTSBURGH, PA.

NEW YORK, N. Y.
CHICAGO, ILL.

CLEVELAND, OHIO
DETROIT, MICH.

BRANCH OFFICES

INDIANAPOLIS, IND.
HOUGHTON, MICH.

BOSTON, MASS.
SAN FRANCISCO, CAL.

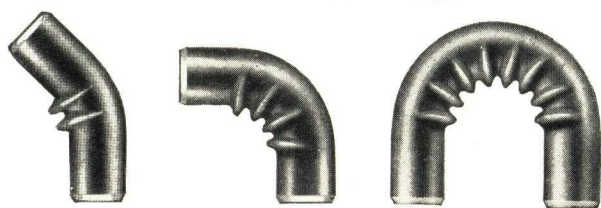
Products and Services

COMPLETE PIPING SYSTEMS designed, fabricated and installed. Licensee of SARLUN JOINTS, CREASED BENDS and CREFLEX WELDING FITTINGS.

Fabricators of all types of welded headers, pipe bends, supports and cast fittings in either plain carbon or alloy steels.



Creflex Welding Fittings



Creflex Welding Fittings greatly facilitate the erection of all-welded installations due to their features.

Tangents may be any length desired. This means that all line welds can be removed from the location of compound stresses due to expansion.

Several fittings can be made in one or more planes in one length of pipe, thus reducing the number of circumferential welds to a minimum.

They are furnished to any desired length and come with machine-tool beveled ends.

All Creflex Welding Fittings are made of seam-

less steel pipe in thicknesses conforming to A.S.T.M. specifications.

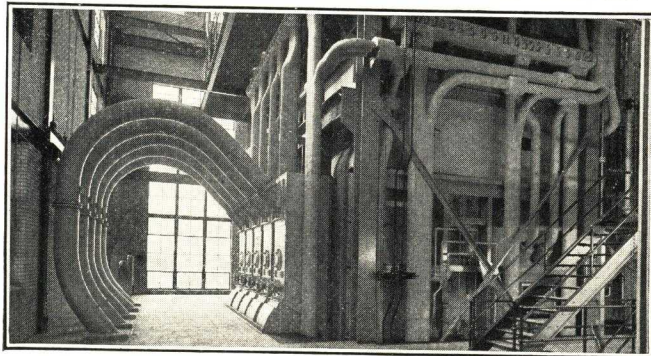
For engineering data ask for Bulletin W-101.

Creased Bends

Creased Bends are designed to conserve space. They are made on very short radii, usually 2 to $2\frac{1}{2}$ times the nominal pipe diameter.

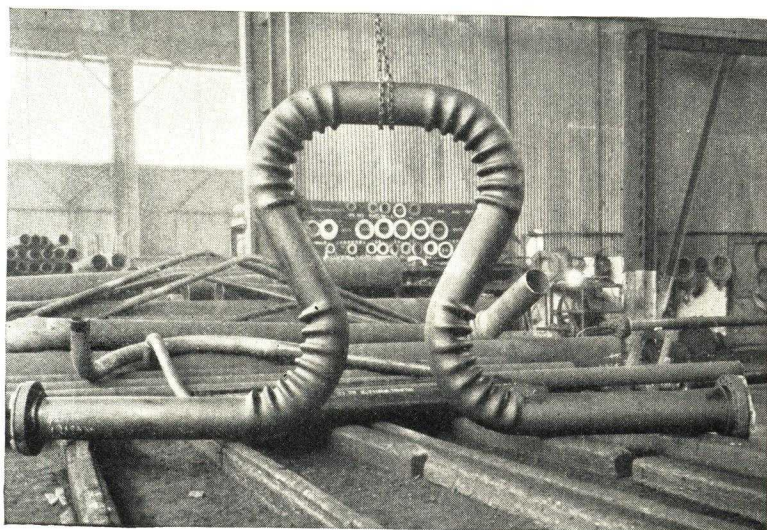
Greater flexibility and uniform wall thickness are other features. They are made for all pressures and temperatures and are particularly adapted to piping systems where space is limited or increased flexibility is needed.

For additional information ask for Bulletin B-201.



Accuracy and Efficiency Are Characteristic of Every Pittsburgh Piping Installation

Thirty years' experience fabricating piping materials combined with unusual plant facilities and modern methods enables PITTSBURGH PIPING & EQUIPMENT CO. to execute your requirements with foresight and speed.



12-in. Creased Double Offset U Expansion Bend



A 36-in. Cast Iron Multiport Check Valve
For use in large steel plant

BENJAMIN F. SHAW CO.

Power-Plant and Industrial Piping Contractors and Fabricators
WILMINGTON, DEL.

"SHAWCO" SEAMLESS STEEL PIPING—FOR HIGH PRESSURES

"Shawco" Organization and Facilities

For 40 years we have specialized in the Design, Fabrication and Installation of Power Plant and Industrial Piping—and are especially competent to execute jobs for the highest working pressures. This statement is proved in fact, by the successful operation of "SHAWCO" PIPING in such undertakings as the new Skenandoa Rayon Plant at Utica, N. Y., The Potomac Electric Power Company (Benning's Station), Deepwater Central Power Station, Deepwater, N. J. (1350 lb. lines), the new Philip Carey Plant (1840 lb. pressures) and many other difficult jobs.

"Shawco" mechanics are craftsmen who have spent years on high pressure piping projects, and know the art of forging, welding, grinding, bending and fitting steel pipe, as few know it.

Engineers everywhere realize that they are safe in entrusting their piping contracts to "Shawco," because we are experienced, competent, reliable and *financially responsible*. Furthermore, these advantages are backed by: Up-to-date plant equipment, large plant capacity, an efficient engineering department, and an experienced field organization. *A "Shawco" job is an "engineered" job.*

Some of the largest and most prominent piping jobs in America are "Shawco" jobs.



"Shawco" "100% Tight" Piping Jobs

When Shaw Company completes a piping job—that job is *absolutely as tight* as man can make it.

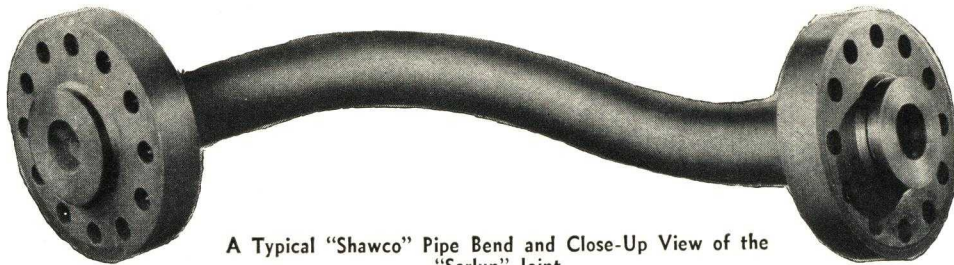
We have installed a piping job containing over 700 Sarlun joints for 1350 lb. pressures in the steam and boiler feed lines. Every joint in this job remained 100% tight from the day of the first installation and test, up to the present. Experts consider this an achievement in piping work—a most difficult job that stands out as a perfect piece of workmanship, both as to fabrication and installation.

However, "Shawco" work is not entirely confined to high pressure conditions, we are equally as effective and dependable on low pressure installations; they are just as welcome to us and receive the same consideration as to details and execution, as do high pressure jobs.

We invite the unusual as well as the usual job. This organization can take the initiative and responsibility for the most difficult piping work that industrial engineers encounter.

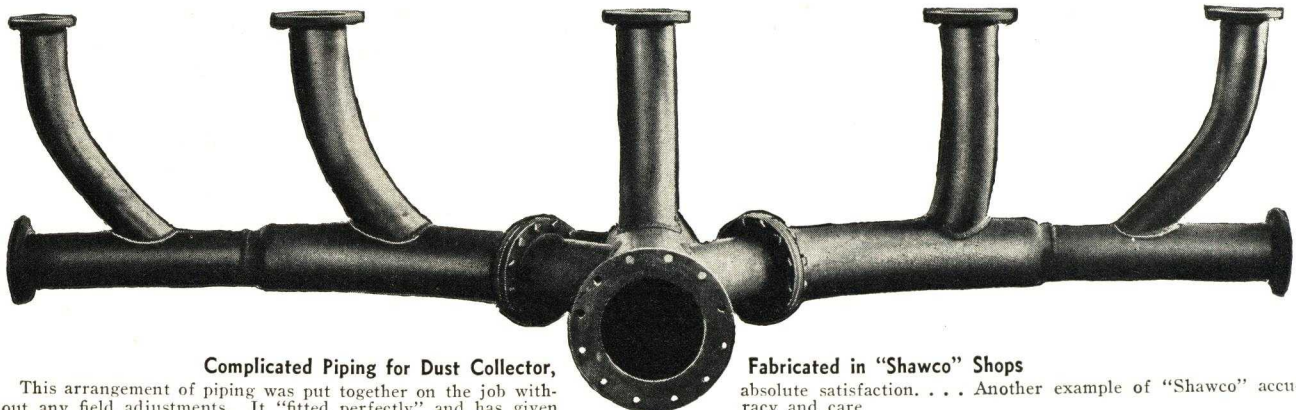
Put those jobs in our hands, and *make us responsible* for their success.

Send for the "Book of Installations."



A Typical "Shawco" Pipe Bend and Close-Up View of the "Sarlun" Joint

Note the smooth, finely ground flange faces, and the square corner lips of the "Sarlun" Joint (evidence of superior workmanship and expert fabrication). 131 of these "Sarlun" Joints were supplied by us for the Philip Carey Plant, operating at 1840 lbs. pressure—which we believe is the "highest pressure" in use in the United States. Every joint and every piece of pipe was fabricated in our shops



Complicated Piping for Dust Collector,
This arrangement of piping was put together on the job without any field adjustments. It "fitted perfectly" and has given

Fabricated in "Shawco" Shops

absolute satisfaction. . . . Another example of "Shawco" accuracy and care

TAYLOR FORGE & PIPE WORKS

GENERAL OFFICES AND WORKS
Box 485, CHICAGO, ILL.

NEW YORK OFFICE, 50 Church Street, NEW YORK, N. Y.

Products

TAYLOR FORGE PIPE FITTINGS for WELDING; TAYLOR SPIRAL WELDED PIPE; SPIRAL RIVETED PIPE; O. D. LAP WELDED PIPE; FORGED STEEL PIPE FLANGES.

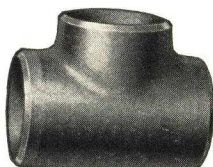
Also manufacturers of Rolled Steel Rings; Seamless Forged Steel Boiler Nozzles; Welding Necks; Corrugated Morison Type Boiler Furnaces; etc.

Taylor Forge Pipe Fittings for Welding

In offering this complete line, Taylor Forge makes available a *seamless* manufactured fitting for all of the major applications that occur in pipe line welding. Standard Radius and Long Radius Elbows, Full Branch and Reducing Tees, Reducing Nipples, Welding Caps and Welding Neck Flanges can be had from stock in a full range of sizes.

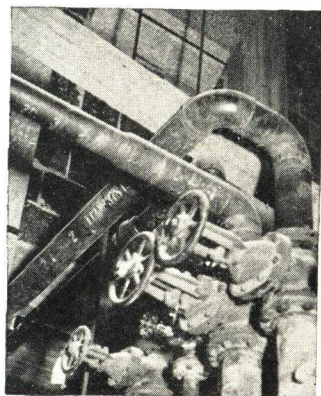


Taylor Forge
Standard Radius Ell



Taylor Forge
Full Branch Tee

The introduction of Taylor Forge Seamless Fittings is undoubtedly a welcome advance in pipe welding. They substitute stream-line sweeps for sharp corners—substitute uniformity for uncertainty—trim, workmanlike appearance for awkward cut-fit-patch appearance.



A combination of features found in no other type of welding fitting has been incorporated in their design. Ends are machine-tool beveled to facilitate the making of uniformly sound, roundabout V-Butt Welds. Short tangents simplify alignment. Selectively reinforced for greater strength. Dimensions are accurately maintained—full inside diameters—full center-to-end measurement—true radius and perfect-circle ends. Taylor Forge Fittings are available in steel or from Byers Genuine Wrought Iron Pipe.

O. D. Lap Welded Pipe

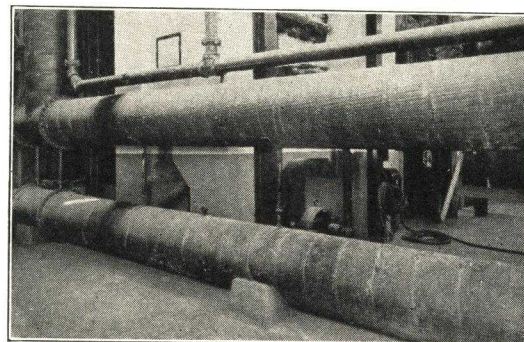
For low or high pressure lines, pressure vessels, drive pipe, heat exchangers, etc., in fact any service where large diameter pipe or shells are required.

Taylor Forge Pipe is lap welded by the forge welding process, and possesses the qualities of a seamless steel tube, having an absolutely smooth interior and exterior. Following forging of the seam each length is rerolled and annealed, producing a pipe thoroughly round, straight and of high, uniform strength. Ends can be flanged, Van Stoned, beveled, or threaded and coupled.

Taylor Pipe is fabricated from highest quality open-hearth steel plate, or from Byers Genuine Wrought Iron, to any I.D. or O. D. size from 14 in. to 96 in., in thicknesses up to 1 1/4 in.

Taylor Spiral Pipe

The basic features of Taylor Spiral Pipe—unusually light weight, exceptional strength, and long life—have given it an enviable reputation among engineers for a wide range of services. Wherever piping is required, for lines conveying oil, gas, water, air, exhaust steam or for similar application, this lightweight pressure piping will fulfill the need efficiently and economically.



28-in. Spiral Pipe Water Supply to Power House

Taylor Spiral Pipe is available made from steel or from Armco Ingot Iron, and is furnished either hot dipped in asphalt, hot galvanized, or plain black for field-applied coatings. Sizes range from 3-in. to 42-in. diameter; lengths, up to 40 ft.

Forged Steel Pipe Flanges

Taylor Forge Flanges, representing a series of engineering developments in which we have pioneered for more than 25 years, are today practically standard in all power plant, refinery and industrial piping practice. Engineers and designers have come to place complete dependence upon their performance.

These flanges are forged seamless from open-hearth billets carefully selected, and are of a tough, close-knit grain structure typical of a well-worked metal body.



Prompt Shipment from a Stock Exceeding 100,000 Flanges

Intensive research and engineering, combined with tremendous production facilities, special equipment and patented methods, make it possible for us to design and manufacture flanges of all sizes and types, for practically any pressure and purpose.

Engineering Data Describing Taylor Forge Products Mailed on Request

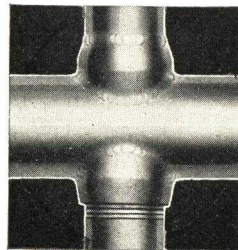
BONNEY FORGE AND TOOL WORKS

FORGED FITTINGS DIVISION

Manufacturers of Bonney Weldolets and Thredolets

MAIN OFFICE

ALLENTOWN, PA.



WELD OLETS · THRED OLETS

Weldolets and Thredolets are stock fittings for pipe welding.

By their use, lining up work is greatly simplified and no time is lost in laying out, trimming and fitting. They practically eliminate icicles.

Weldolets and Thredolets compensate for loss of strength in the main pipe caused by cutting the hole. Their funnel shaped outlets reduce friction and turbulence.

Except in the very large sizes, which are steel castings, Weldolets and Thredolets are forged from special analysis steel suitable for good welding.

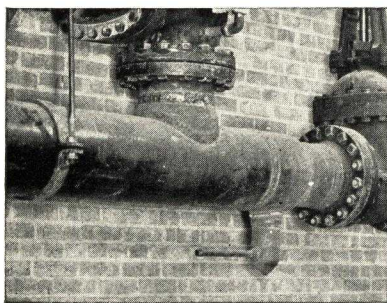
Special Sizes and Materials

Weldolets and Thredolets of materials other than steel and of special sizes are made to order. Write to BONNEY FORGE AND TOOL WORKS for complete information and literature on Weldolets and Thredolets.

STANDARD STOCK SIZES OF BONNEY REDUCING WELD OLETS AND THRED OLETS

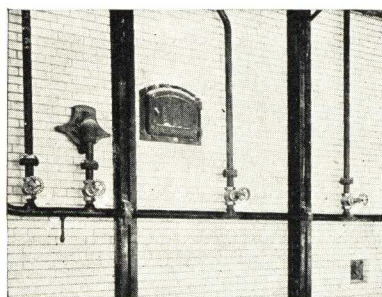
Pipe size, in.	Outlet sizes, in.													
	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10
1	1x1 1/2	1x3/4												
1 1/4	1 1/4 x 1/2	1 1/4 x 3/4	1 1/4 x 1											
1 1/2	1 1/2 x 1/2	1 1/2 x 3/4	1 1/2 x 1	1 1/2 x 1 1/4										
2	2x1 1/2	2x3/4	2x1	2x1 1/4	2x1 1/2									
2 1/2	2 1/2 x 1/2	2 1/2 x 3/4	2 1/2 x 1	2 1/2 x 1 1/4	2 1/2 x 1 1/2	2 1/2 x 2								
3	3x1 1/2	3x3/4	3x1	3x1 1/4	3x1 1/2	3x2	3x2 1/2							
3 1/2	3 1/2 x 1/2	3 1/2 x 3/4	3 1/2 x 1	3 1/2 x 1 1/4	3 1/2 x 1 1/2	3 1/2 x 2	3 1/2 x 2 1/2	3 1/2 x 3						
4	4x1 1/2	4x3/4	4x1	4x1 1/4	4x1 1/2	4x2	4x2 1/2	4x3	4x3 1/2					
5	5x1 1/2	5x3/4	5x1	5x1 1/4	5x1 1/2	5x2	5x2 1/2	5x3	5x3 1/2	5x4				
6	6x1 1/2	6x3/4	6x1	6x1 1/4	6x1 1/2	6x2	6x2 1/2	6x3	6x3 1/2	6x4	6x5			
8	8x1 1/2	8x3/4	8x1	8x1 1/4	8x1 1/2	8x2	8x2 1/2	8x3	8x3 1/2	8x4	8x5	8x6		
10	10x1 1/2	10x3/4	10x1	10x1 1/4	10x1 1/2	10x2	10x2 1/2	10x3	10x3 1/2	10x4	10x5	10x6	10x8*	
12	12x1 1/2	12x3/4	12x1	12x1 1/4	12x1 1/2	12x2	12x2 1/2	12x3	12x3 1/2	12x4	12x5	12x6	12x8*	12x10*

*These sizes are made in Weldolets only.



Weldolets Installed by Electric Arc Welding

Construction of this type is extremely difficult when done by pipe-to-pipe intersection welding



Thredolets on Soot Blower Lines of the Penn Mutual Building, Philadelphia, Pa.

This type of fitting has a tapped outlet

FULL SIZE OUTLET AND PIPE SIZES, INCHES

Weldolets	Thredolets
1x1	3/4 x 3/4
1 1/4 x 1 1/4	1x1
1 1/2 x 1 1/2	1 1/4 x 1 1/4
2x2	1 1/2 x 1 1/2
2 1/2 x 2 1/2	2x2
3x3	2 1/2 x 2 1/2
3 1/2 x 3 1/2	3x3
4x4	3 1/2 x 3 1/2
5x5	4x4
6x6	5x5
8x8	6x6
10x10	
12x12	

GRINNELL COMPANY, INC.

EXECUTIVE OFFICES
PROVIDENCE, R. I.

OFFICES IN PRINCIPAL CITIES

For Automatic Sprinkler Systems, Unit Heaters and Pipe Hangers, see Manufacturers' Index

GRINNELL WELDING FITTINGS

A Recent Major Addition to the Grinnell Line of Piping Supplies

Welding Elbows and Returns

The process of manufacturing Grinnell Welding Elbows and Returns is not a bending process and is protected by U. S. and Foreign Patents.



**90° Elbows
Long Turn**
Standard weight
Extra heavy weight



**45° Elbows
Long Turn**
Standard weight
Extra heavy weight



**90° Elbows
Short Turn**
Standard weight



180° Returns
Short Turn Long Turn
Standard weight
Extra heavy weight

Grinnell Welding Elbows and Returns, illustrated above, have the following distinguishing features:

1. Made from seamless steel tubing.
2. Uniform thickness of inner and outer walls.
3. Wall thickness same as steel pipe.
4. Homogeneous metal structure throughout.
5. No buckling or deformation.
6. No flattening of cross section.
7. Conformity to standard and extra strong pipe sizes.

Fittings can be cut on the job, straight across the pipe, to any desired angle quickly and accurately, and any simple or compound bend may be made by a combination of two or more fittings.

To Specify

In order to obtain the best in Welding Fittings of the Elbow and Return types, be sure to specify as follows:

1. To be made from Seamless Tubing.
2. To have a radius of $1\frac{1}{2}$ times the diameter of the pipe.
3. To be of even wall thickness throughout.
4. Cross sections to be truly circular.

With such specifications in effect there is absolute assurance that the Welding Elbows and Returns will meet the same requirements as the welded pipe or seamless pipe itself as regards pressures, temperatures, etc.

Grinnell Welding Fittings absolutely meet these qualifications.

Welding Tees

(Patents Applied For)



Welding Outlets and Threaded Outlets

(Patents Applied For)



Welding Outlets



Threaded Outlets

Grinnell Welding Tees, being of the same physical characteristics as standard, extra strong and o.d. steel pipe or seamless steel pipe of comparable pipe size, can be used under same conditions, pressures, and temperatures as the pipe itself.

They have these distinctive features: Made from seamless pipe; one-piece fitting—no seams; outlet presents a smooth rounded surface.

Lap Flanged Welding Necks



Grinnell Lap Flanged Welding Necks are regularly furnished for working steam pressures of 150, 300, 400 and 600 pounds at total temperatures up to 750° F., and can be furnished on order for higher pressures.

Each welding neck consists of a forged steel flange and a short piece of steel pipe or tubing with square lap having a thickness of at least 100 per cent of pipe walls. Opposite end of neck is scarfed for welding.

Grinnell Welding Outlets and Threaded Outlets are stock fittings properly designed for pipe welding and provide a simple and economical method of making welded branch connections. They can be used wherever it is desired to make tees, side outlet tees, crosses, etc., by welding.

Welding Outlets are for use in welded pipe installations and are suitable for practically all pressures and services. Only two simple welds are required, one at point of contact with main line, the other where the branch pipe joins the outlet.

Threaded Outlets require only one simple weld, as the outlet end is threaded. They are used principally for low pressure heating systems, for radiator outlets, branch lines, etc., but may be used for other services and pressures.

Grinnell Welding Outlets and Threaded Outlets are steel drop-forgings, except in the largest sizes which are cast steel and annealed. They have a heavy external reinforcement which provides great strength and dissipates the excess heat when welding, thus preventing shrinkage and distortion. Wide bases are correctly shaped to fit the pipe, resist bending stresses and provide funnel shaped inlets which reduce friction.

Literature

Bulletins giving list prices, dimensions, etc., on each of the above groups will be sent upon request. Address GRINNELL COMPANY, INC., 227 W. Exchange Street, Providence, R. I.

MIDWEST PIPING & SUPPLY CO., INC.

Power Plant, Oil Refinery and Industrial Piping—Also Pipe Welding Fittings

MAIN OFFICE

1430 South Second Street, ST. LOUIS, MO.

SHOPS: ST. LOUIS, MO., LOS ANGELES, CAL., PASSAIC, N. J. (Ballwood Div.), and HOUSTON, TEX.

CHICAGO OFFICE: 20 No. Wacker Drive

LOS ANGELES OFFICE: 520 Anderson Street

TULSA OFFICE: 733 Mayo Building

NEW YORK OFFICE (Ballwood Div.): 30 Church Street

HOUSTON OFFICE: 600 Bringham Street

Midwest Welding Ells—90° and 45°

The dotted lines indicate the *longer tangents* provided only on Midwest Welding Ells. Tangent length is $\frac{1}{4}$ of nominal fitting diameter; a 12-in. Midwest Ell has tangents 3 ins. long. Advantages of these longer tangents are:

1. They make it possible to more quickly and accurately line up the pipe and fitting.
2. They make it easier to use lining-up clamps than when fittings have very short tangents or none at all.
3. They remove the weld from the point of maximum bending stress (the end of the arc).
4. They reduce the amount of pipe required.
5. They frequently eliminate the use of a short nipple and the extra circumferential weld it requires.
6. They make it possible to slip on forged steel flanges and weld them front and back.



The radius of every Midwest Welding Ell is $1\frac{1}{2}$ times the nominal diameter: a 4-in. Ell has a 6-in. radius. It is generally recognized that this is the shortest radius that can be used without encountering excessive pressure drop. This radius also reduces the amount of pipe required and makes the circumferential welds more accessible.

Unusual dimensional accuracy and uniformity are other important advantages of Midwest Ells. Every Ell is first made slightly *oversize*—it is then reheated and *reduced* to correct size by a special operation in *compression*.

This process was developed by Midwest, and is used exclusively by Midwest.

Each Ell is made from one piece of plate by a patented Midwest process. The welded longitudinal seam along the inner circumference is made with a high tensile strength alloy rod and has a bead that makes it considerably heavier than the wall thickness; consequently, it acts as a reinforcing rib.

Final working of the metal is in compression at a forging heat—it is not extruded or stretched. Normalizing both plate and weld relieves any stresses set up either in forming or welding. Made from the same material as Grade A seamless steel

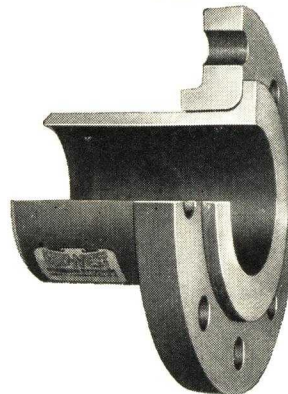
MIDWEST

TRADE-MARK

pipe, Midwest Ells have the same co-efficient of expansion and welding characteristics. They are also made from Reading Puddled Iron.

Stock sizes in both standard and extra heavy weight are $\frac{3}{4}$ to 18 ins. Made larger and from any standard alloy on special order.

Other Midwest Welding Fittings



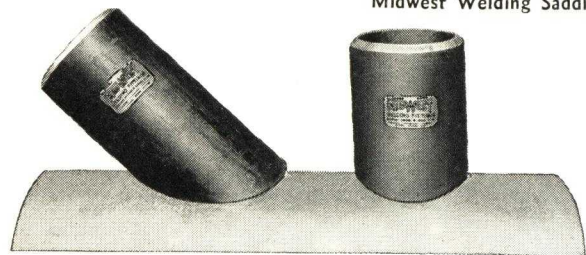
Midwest Van Stone Welding Nipple



Midwest Welding Head



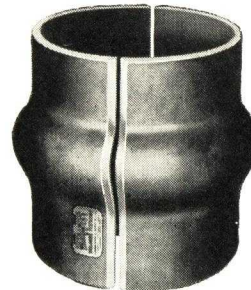
Midwest Welding Saddle



Midwest Shaped Welding Nipples



Midwest Welding Reducers
(Both concentric and eccentric)



Midwest Welding Sleeve



Midwest Welding Flanges
(Both slip-on and butt welding)

Complete description of each Midwest Welding Fitting is contained in *Bulletin W/F 10*. Write to nearest Midwest Office for a copy.

Pipe Bends, Coils, Welded Headers, Etc.

Write for bulletins describing in detail Midwest Products and The Greater Midwest Piping Service.

AMERICAN DISTRICT STEAM COMPANY

Manufacturers of Adscio Steam Line Equipment

GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N. Y.

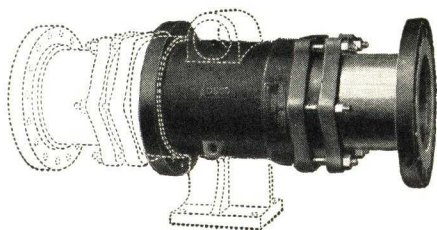
Over 50 Years in Business; Branches and Sales Offices in Principal Cities

Magnitude of Our Business

The AMERICAN DISTRICT STEAM COMPANY manufactures a complete line of expansion joints, angle fittings, anchors, conduit and insulation casing, steam traps, reducing valves, steam flow and condensation meters, water heaters and other allied equipment for underground and overhead steam distribution lines. Absco Equipment is used on over 90% of the country's district heating projects. Its records of service on these installations commend it for use on every steam system that must perform efficiently and economically over an extended period of time.

Adisco Slip-type Expansion Joints

Made in a complete range of sizes and types for every pipe requirement. Check with chart below for different variations in which each joint illustrated is obtainable.



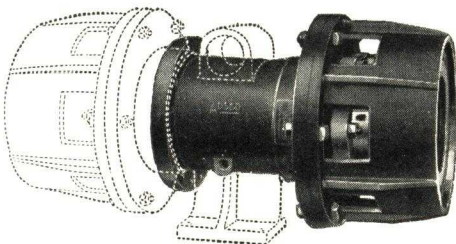
Adsc Semi-guided
joint

Made in 125-lb. and 250-lb. designs
125-lb.: S-1, S-2, S-3, S-4, D-2, D-4.
250-lb.: S-5, S-6, S-7, S-8, D-6, D-8



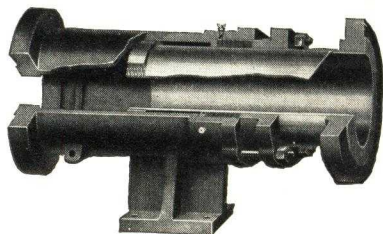
Adscos Semi-guided Tie Rod Joint

Made in 125 and 250-lb. designs
125-lb.: S-1-T, S-2-T, S-3-T, S-4-T, D-2-T, D-4-T.
250-lb.: S-5-T, S-6-T, S-7-T, S-8-T, D-6-T, D-8-T.



Adsc Externaly Guided Joint

Made in 125 and 250-lb. designs
125-lb.: S-1-G, S-2-G, S-3-G, S-4-G, D-2-G, D-4-G.
250-lb.: S-5-G, S-6-G, S-7-G, S-8-G, D-6-G, D-8-G



Adscos Internally Guided Joints

Any slip type expansion joint shown on this page can be equipped with the internal guide feature as illustrated above.

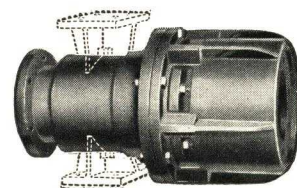
Adisco Screwed End Joint

B-1—All brass; H-1—Iron body; R-1—Internally guided for risers



Adsc Duplex Sleeve-guided (Air Insulated Slip) Joint

For pressures up to 400 lb. and temperatures to 750° F. L-9, L-10, L-11



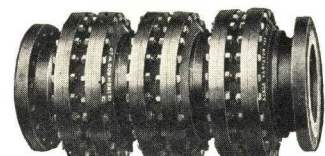
Adscopackless Expansion Joints (Variators)

Adscos Multiple Diaphragm Variator—

Applies the proved principles of construction used for over 25 years in ADSCO Low-Pressure Variators, with new metals substituted in diaphragm and body to provide for heavy duty service. Recommended for use on high pressure, high temperature lines where complete freedom from leakage and maintenance is essential during entire life of installation.

Adsco Low Pressure Variators—

Proved over a period of 25 years, hundreds being in underground service for 20 years or more without attention of any kind.



Adscs Multiple Diaphragm Variator

For pressures up to 250 lbs. and 400 lbs. and temperatures up to 750° F. Made in a complete range of sizes from 3 to 20 in.; in single and multiple diaphragms to provide from 3/4-in. to 4 1/2-in. traverse



Model O Double Variator

Made in single and double diaphragm types for pressures to 50 lb.; total traverse, 2¾ in.

Model R
Variator

Double diaphragm
type only
For pressure to
125 lb.; total tra-
verse, 2 in.

Literature

Write for complete
Adscot Catalogue.

PRESSURE CONDITIONS

[illegible]

E. B. BADGER & SONS CO.

Engineers and Manufacturers

75 Pitts Street, BOSTON, MASS.

BRANCH OFFICES

ATLANTA, GA., 140 Edgewood Avenue
CHARLOTTE, N. C., 1408 Independence Building
CHICAGO, ILL., 2831 South Parkway
CINCINNATI, OHIO, Union Trust Building
CLEVELAND, OHIO, Guardian Building
DETROIT, MICH., 702 Cadillac Square Building

HOUSTON, TEX., 1308 Second National Bank Building
INDIANAPOLIS, IND., 823 Occidental Building
KANSAS CITY, MO., 1336 Oak Street
LOS ANGELES, CAL., 812 Quinby Building
MINNEAPOLIS, MINN., 732 Builders Exchange
MONTREAL, QUE., Canada Cement Building
NEW ORLEANS, LA., 1666 Abundance Street

NEW YORK, N. Y., 271 Madison Avenue
PHILADELPHIA, PA., 1500 Walnut Street
PITTSBURGH, PA., Union Trust Building
ST. LOUIS, MO., 3605 Laclede Avenue
SALT LAKE CITY, UTAH, Kearns Building
SAN FRANCISCO, CAL., Sharon Building
SEATTLE, WASH., Smith Tower
TULSA, OKLA., 409 E. Archer Street

Products and Services

CORRUGATED COPPER EXPANSION JOINTS.
Pipe Bends.
Chemical Apparatus.
Copper and Sheet Metal Work.
Copper Boilers.
Hot Water Tanks.
Engineers on Process Work.



Different Types Available

Both flanged end and welding end joints are available from 3 in. (welding) and 4 in. (flanged) up. Single or double joints with or without service outlets. All joints can be equipped with telescoping monel metal sleeves to protect against superheated steam. We can furnish flanged joints less than 4 in. in size by fitting the 4-in. units with companion flanges, bolts and gaskets tapped to the desired size.

Badger Self-Equalizing Expansion Joints

These have been on the market for more than forty years and as sold today represent the results of a series of distinct improvements. Badger engineers are responsible for such developments in the corrugated type of joint as: special analysis copper—of which the seamless tubes have been made—the equalizing rings, the monel metal sleeve to protect against superheated steam, and the welding end joint. Now, Badger Joints carry another big improvement in a new design corrugation which functions on the principle of Directed Flexing.

Before passing to this subject, a word about the importance of using the corrugated type of joint. Not only is it compact and easily installed, but it requires no maintenance. No packing is used.

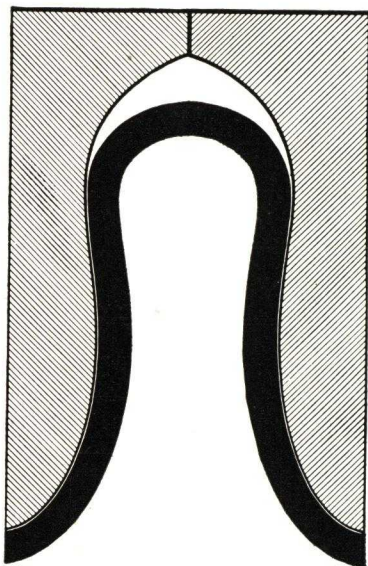
Directed Flexing

The shape of the new Badger Corrugation is entirely curved. There are no straight sides where flexing stresses can localize and thus cause crystallization of the metal. In action the corrugation undulates, using the equalizing ring as a guide.

This is the so-called "Directed Flexing." Instead of being left to chance, the flexing of the metal is guided so as to undulate along an all-curved surface.

Longer joint life is the direct result of this improvement.

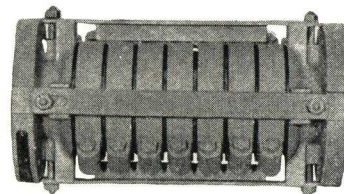
A new bulletin, describing this new corrugation, will be sent on request.



Flanged Types

Fitted with alignment bars on the 4 and 5-in. sizes. Choice of standard or extra heavy flanges. From 1 to 3-in. expansion inclusive.

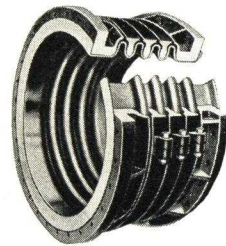
On 6-in. pipe and larger, no alignment bar is used. Standard 125-lb. or extra heavy 250-lb. flanges as required. From 1 to 4-in. expansion inclusive.



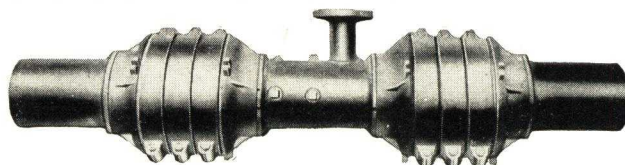
Welding Types

For use with both saturated and superheated steam. Single type from 3 in. up, to take care of 1-in. expansion or more. Pipe nipples welded directly into pipe line.

Double units for 2-in. expansion or more. Equipped



with service outlets, if desired. Complete units furnished, mounted on base plate, with anchor and guides.



Single and Multiple Corrugated Expansion Joints for Low Pressure

For use between turbine or engine exhausts and condenser or on low pressure lines. Excellent for absorbing shock and vibration. Flanges in round, oval or rectangular shapes. Guaranteed up to 30 lb. pressure.

BADGER FIRE EXTINGUISHER CO.

Manufacturers of Expansion Joints and Fire Extinguishers

Park Square Building, BOSTON, MASS.

EXPANSION JOINTS FOR PIPE LINES

Ring Controlled Expansion Joints

Designed to include all the factors required for best and most efficient type of expansion joint in either low or high pressure service. Recommended for steam plant installation and for general use. It *requires no packing of any kind*, lends itself to maximum flexibility, and absorbs all vibration and expansion. Joints are made of a single piece of seamless copper tubing, corrugated under pressure. Specially designed iron or steel rings and flanges properly distribute the stresses uniformly over entire length of joint, thereby preventing undue strain and fracture. A steel jacket or sleeve on this joint protects corrugations and rings from dirt and exposure to rust and also keeps corrugations in alignment and makes insulation easy. This protecting jacket greatly lengthens the life of the joint.

All materials used in our Ring Controlled Joints are selected only after most rigid tests. Superior workmanship and care in manufacture enter into construction of each joint. All joints are tested hydrostatically before shipping.

Joints for 125 lbs. working pressure are fitted with American Standard Flanges, unless otherwise specified; joints for 125-250 lbs., with Extra Heavy Flanges.

When Ordering Ring Controlled Expansion Joints—When ordering, give the following data:

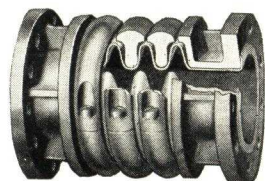
(1) Diameter of pipe. (2) Whether for steam, water, liquid air or gas. (3) Working pressure.

(4) Range of temperature. (5) Amount of expansion to be cared for. (6) Length of pipe (sketch of layout is preferable). (7) Material: whether cast iron, steel or copper. (8) How often system is turned on and off. (9) Whether or not for super heat. (10) Whether American Standard or Extra Heavy Flanges. (11) Whether flanged or welding end type wanted.

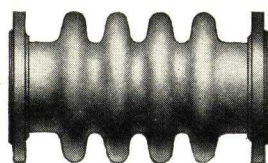
Single Corrugation Copper Expansion Joints

These joints are for either pressure or exhaust work. Primarily they are used for exhaust service, as between turbine and condenser, and for work where little expansion takes place but there is likely to be more or less vibratory motion. Under such conditions a single deep corrugation joint is of great value. Can also be used under pressure for same service. As used for exhaust these joints are constructed to resist a vacuum and are good for any exhaust pressure up to 25 lbs. Usually fitted with American Standard Low Pressure Flanges, but can be furnished with flanges to suit any conditions.

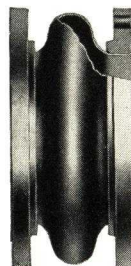
For exhaust service where extreme freedom of action is needed, a multiple corrugation expansion joint will give greater efficiency than a single unit in that less pressure on flanges is required to obtain motion in corrugations. In this case a deeply corrugated joint is used to give as much flexibility as possible. Regulation rings are recommended to avoid undue strain and to prevent sudden collapse.



Flanged Type of Ring Controlled



Low Pressure



Single Corrugation



Welding Type of Ring Controlled

Expansion Joints for Pipe Lines

FIRE EXTINGUISHERS

Approved by Underwriters' Laboratories and Factory Mutuals' Laboratories

Construction of Badger's Fire Extinguishers

All Badger's Fire Extinguishers are built for life-time service. Tested to over 350 lbs. Working parts are extra heavy, made of special corrosion-resisting composition.

Types of Badger's Fire Extinguishers

Vaporizing Liquid Extinguishers—Sizes, 1 qt. and 1½ qt. For protection against electrical fires on trucks, motor boats, and for general use. *Non-freezing.* Complete with charge and wall hanger.

Soda-Acid Extinguishers—Sizes, 2½ gal. and 1¼ gal. For general use in ordinary combustible fires, in homes, schools, public buildings, etc. *Must be protected from freezing.* Complete with charge and wall hanger.

Foam Extinguishers—Sizes, 2½ gal. and 1¼ gal. For fires in oils, greases and inflammable liquids, also for general uses. *Must be protected from freezing.* Complete with charge and wall hanger.

Non-Freeze Extinguishers—Sizes, 2½ gal. and 5 gal. For ordinary combustible fires. *Effective in all temperatures.* Complete with charge and wall hanger.



Vaporizing Liquid



Non-Freeze Extinguisher

Types of Badger's Fire Engines

Soda-Acid Engines and Non-Freeze Engines—Size, 40 gal. Both types of engines are made in two styles: Warehouse Engine with narrow tread for indoor use and Truck Engine with wide tread and mounted on springs for outdoor use.

20-gal. Soda-Acid Engines—Made with small wheels for easy handling in buildings.

Foam Engines—Size, 40 gal. Manufactured in four models: Warehouse Type, with narrow tread and short handles; Truck Type, with wide tread, and either short or long handles; Truck Type, with wide tread, long handles, drag rope and reel; Airport Type, with wide tread, 8-in. face, roller-bearing wheels, drag rope and reel.

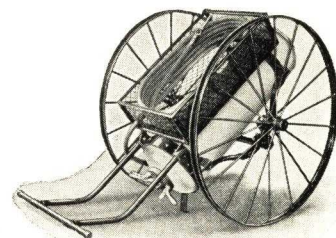
Recharges

Soda-Acid—In 1¼, 2½ and 40-gal. sizes.

Vaporizing Liquid—In 1-qt. and 1-gal. tins and 50-gal. drums.

Foam—In 1¼, 2½ and 40-gal. sizes.

Non-Freeze—In 2½, 5 and 40-gal. sizes.



40-gal. Non-Freeze Engine

GRINNELL COMPANY, INC.

EXECUTIVE OFFICES
PROVIDENCE, R. I.

OFFICES IN PRINCIPAL CITIES

For Automatic Sprinkler Systems, Unit Heaters and Welding Fittings, see Manufacturers' Index

GRINNELL ADJUSTABLE PIPE HANGERS AND SUPPORTS

Illustrated below are a few of the complete line of hangers and supports, adjustable both before and *after* installation, reflecting many decades of experience in our own contract work.

As floors are loaded and building foundations settle, all pipe lines eventually get out of alignment, no matter how carefully the installation is made. In consequence, efficiency and safety decrease and maintenance costs

increase. Grinnell Adjustable Hangers quickly correct these conditions when given a few turns to restore alignment. They also facilitate rapid installation and avoid the delay involved in getting special hangers.

Send for Hanger Catalogue showing complete line. Address, GRINNELL COMPANY, INC., 277 West Exchange Street, Providence, R. I.

Adjustable Swivel Rings (Patented)

Solid Ring Type—Can be used with coach screw rod or machine threaded rod in connection with practically any type of ceiling flange, expansion case, insert, etc.

The unusual feature of this ring is the swivel shank. An adjustment of at least 1½ in. is secured by simply turning the nut on the shank.

By means of a unique locking device the swivel shank automatically locks, preventing loosening due to vibration in the pipe line.



Fig. 104. Split Ring Type Fig. 101. Solid Ring Type
Adjustable Swivel Rings

Split Ring Type—Used with coach screw rod or with machine threaded rod. The swivel shank feature allows the same adjustment as in Fig. 101, and the off-center hinging of the ring, by providing sufficient seating to hold pipe securely, permits adjustment either before or after the ring is closed. A wedge type pin is loosely but inseparably cast into the hinged section for fastening this section after pipe is in place.

Adjustable Swivel Pipe Roll (Patented)

The Grinnell Adjustable Swivel Pipe Roll supplies the need for an adjustable type of pipe roll hanger with single hanger rod.

It is unique, inasmuch as vertical adjustment can be made by use of the swivel shank at the top of the hanger.

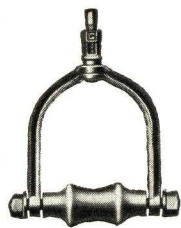


Fig. 174. Adjustable Swivel Pipe Roll

Universal and Simplex Concrete Inserts (Patented)

Made of malleable iron, they have ample vertical and horizontal adjustment. Four widely separated nail slots, low height and large bottom surface all tend to minimize the chance of displacement during construction, whether nailed to wood or pasted to steel forms.

Universal Inserts are made in one body size, to take a special removable nut.

Nuts are furnished tapped for ⅜, ½, ⅝ or ¾-in. rod as required, and are automatically locked laterally by means of serrated teeth on both insert and nut.

Simplex Inserts are made in five body sizes with nuts assembled in place and not removable, for rod tapings ⅜ to ⅞ in., inclusive.



Fig. 280. Universal Insert



Fig. 281. Simplex Insert

The U.F.S. I-Beam Clamp (Patented)

UFS
(Universal Forged Steel)
I-BEAM CLAMP
TRADE-MARK

The U.F.S. I-Beam Clamp is an outstanding development in convenience, strength and adjustability. While made only in three sizes, it covers the whole range of beam sizes from the smallest to Bethlehem 24-in. Forged steel construction gives to each size the same strength as the maximum rod strength involved. Rods carried range from ⅜ to 1½ in., providing for all pipe sizes up to 24 in.

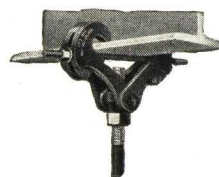


Fig. 228.
U.F.S. I-Beam Clamp

Adjustable Wrought Pipe Clamp

The Adjustable Wrought Pipe Clamp, Fig. 251, consists of two half-bands bolted together and a U.F.S. (lower) forged steel nut, threaded left hand. This pipe clamp is for use with hanger rods threaded right and left. Adjustment is obtained by turning hanger rod. Left hand nut will, when specified, be furnished with set screw to prevent hanger rod from turning.

The pipe clamp in each size is designed to support 12 ft. of extra heavy pipe filled with water and to have a factor of safety of not less than twelve, as called for by the specifications of the Power Piping Society.

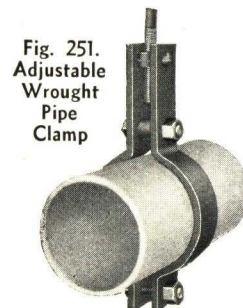


Fig. 251.
Adjustable Wrought Pipe Clamp

Adjustable Pipe Roll Stand, Anchor Chair, Pipe Seat

Used with welded steel brackets. The Grinnell Welded Steel Bracket, Fig. 199, is designed for use with the Grinnell Adjustable Pipe Roll Stand, Fig. 274, Anchor Chair, Fig. 197, and Pipe Seat, Fig. 198, here illustrated. These combine the strongest type of brackets and pipe supports procurable.

Vertical adjustment is obtained by simply adjusting bolts on the roll stand.

A lateral adjustment or movement is possible with the adjustable pipe roll stand and pipe seat by sliding the stand on base plate or seat on the bracket. With the anchor chair, lateral adjustment is also possible, if chair is moved before the nuts on the anchor yoke are tightened.

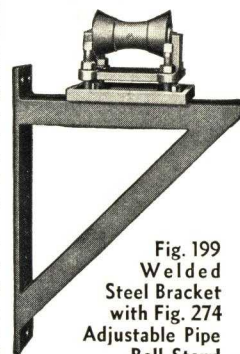


Fig. 199
Welded Steel Bracket with Fig. 274 Adjustable Pipe Roll Stand

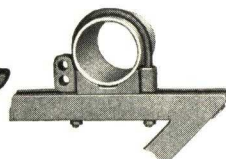


Fig. 197. Anchor Chair



Fig. 198. Pipe Seat

THE CLEVELAND BRASS MANUFACTURING COMPANY

Manufacturers of Valves for Water, Steam and Gas
Oil Specialties

4606-4700 Hamilton Avenue
CLEVELAND, OHIO

BARRETT ACIMET VALVES For Perfect Handling of Corrosive Liquids

The Barrett Acimet Valve provides the best and safest way for handling sulphuric acid and other corrosive liquids. The Acimet Valve withstands corrosive action almost perfectly due to the kind of metal of which the acid-contacting parts are constructed. The reaction of the acid is scarcely noticeable even after years of use. A full uncontaminated flow of liquid is always assured.

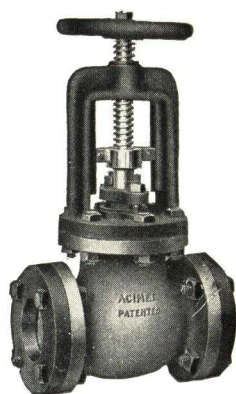
The skeleton or framework is so constructed that not only does the valve seat have extra reinforcement, but

Outstanding Features

1. All acid-contacting parts are made of the famous Acimet lead alloy, thoroughly acid-resisting.
2. Valve body is cast solid for rigidity.
3. Brass reinforcing ring encircles seat to prevent leakage.
4. Easy to adjust stuffing gland.
5. Long-wearing gum rubber gasket.
6. Perfectly machined, stem and seat reinforced.

the body casting strengthens the entire structure. The upper stem, perfectly machined, has a four pitch thread to provide for quick opening. A special swivel device eliminates friction. The lower valve stem does not turn, but acts as a plunger instead of a revolving disc. Wear and tear is reduced. Connecting flanges are made of cast-iron with bolts furnished for all flanges.

A type for every purpose. Literature and prices on request.



Globe Pattern

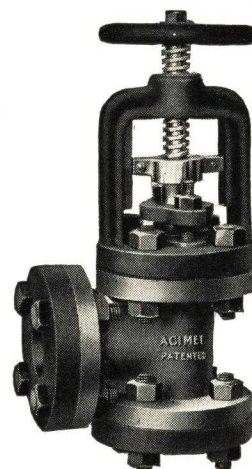
Made in the following sizes, in.	Weight, lbs., including flanges
1	34
1½	52
2	62
2½	85
3	120
4	210
5	300
6	340

Extra heavy flange type for lead and iron pipe connections.

Angle Pattern

Made in the following sizes, in.	Weight, lbs., including flanges
1	34
1½	52
2	62
2½	85
3	120
4	210
5	300
6	340

Connecting flanges furnished for either lead or iron pipe.



Freflo Pattern

Made in the following sizes, in.	Weight, lbs., including flanges
1	40
1½	52
2	65
2½	92
3	113
4	223
5	375
6	482

Especially designed with free-flowing outlet for handling heavy solutions in soap plants, etc.



Check Pattern

Perpendicular and Horizontal Types

Made in the following sizes, in.	Weight, lbs., including flanges
1	34
1½	52
2	62
2½	85
3	120
4	210
5	300
6	340

Connecting flanges furnished for lead or iron pipe.



CRANE CO.

Crane Building, 836 South Michigan Avenue, CHICAGO, ILL.

WORKS: CHICAGO, BRIDGEPORT, BIRMINGHAM, CHATTANOOGA, TRENTON, NORTH TONAWANDA, N. Y.

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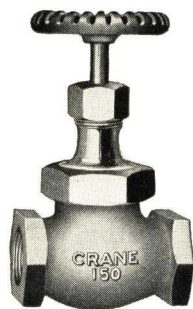
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WORCESTER

CRANE

Valves, Fittings, Specialties, and Fabricated Piping for Any Pipe Line



No. 7 Globe Valve

No. 7 Brass Globe Valves

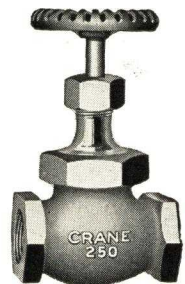
For steam working pressures up to 150 lbs., where discs must be changed quickly without injury to valve. Its disc holder can be slipped off the stem and replaced in an instant with discs for hot or cold water, gas, air, or oil.



No. 27 Check Valve

No. 27 Brass Check Valves

Supplied in either horizontal or angle pattern. For saturated steam working pressures up to 150 lbs. Renewable discs for steam are standard. Also supplied for hot or cold water, or compressed air.



No. 212P Globe Valve

No. 212P Brass Globe Valves

Crane special brass body. Plug type nickel alloy disc. Renewable Exelloy seat. For 250 lbs. steam working pressure up to 500° F. 400 lbs. non-shock water or air pressures.



No. 35 Swing Check Valve

No. 35 Brass Swing Check Valves

May be used in a horizontal position or for upward flow. Re-grinding type. Sizes 2 in. and smaller for steam working pressures up to 200 lbs. Sizes 2½ and 3 in., 150 lbs.



No. 440 Gate Valve

No. 440 Brass Double Disc Gate Valves

For steam working pressures up to 125 lbs. Sizes ¼ to 3 ins. Constructed with parallel seats. The bearing of the wedging device exerts uniform pressure on the entire disc against seats. May be repacked, when wide open, while under pressure.



No. 431 Gate Valve

No. 431 Brass Gate Valves

For steam working pressures up to 125 lbs. Brass disc fits perfectly in tapered seat. Slip on connection enables easy removal of disc from brass stem. The stuffing box can be repacked while valve is in line under pressure.

No. 124 Brass Radiator Valves

With wood handle; rough body, plated all over, and Crane renewable discs.



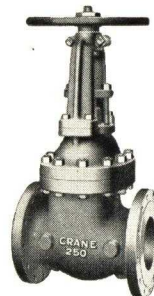
No. 465 Wedge Gate Valve



No. 124 Radiator Valve

No. 465 Wedge Gate Valves

Iron body, brass trimmings. Steel stem. Sizes 16 in. and smaller, for steam working pressures up to 125 lbs. Sizes 18 to 30 in. up to 100 lbs.



No. 7E Gate Valve

No. 7E Extra Heavy Gate Valves

Ferrosteel with hard metal seats. For saturated or superheated steam working pressures up to 250 lbs. with total temperature not to exceed 500° F. Tested to 800 lbs. hydraulic pressure per sq. in.



No. 373 Special Swing Check Valve

No. 373 Special Swing Check Valves with Outside Lever and Weight

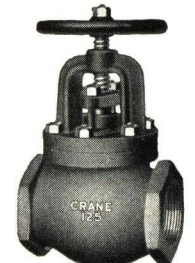
Iron body, brass seat; with brass or leather faced disc. For steam working pressures, sizes 2 to 16 in., 125 lbs. Sizes 16 to 30 in. up to 100 lbs.



No. 21E Globe Valve

No. 21E Extra Heavy Globe Valves

Ferrosteel, bronze seats; without bypass. For saturated and superheated steam working pressures up to 250 lbs., with temperature not to exceed 500° F. Tested to 800 lbs. hydraulic pressure per sq. in.



No. 350 Globe Valve

No. 350 Globe Valves

Iron body, brass trimmings, screwed connections. For steam working pressures up to 125 lbs. Sizes 2 to 8 in.



No. 324 1/2 Iron Cock

No. 324 1/2 Iron Cocks

With brass plug. Screwed connections. Sizes 1/4 to 4 in. For liquid working pressures up to 125 lbs.



No. 270 Gas Service Cock

No. 270 Brass Gas Service Cocks

Sizes 1/4 to 2 in. Flat head.



No. 812 Rough Stop Cock

No. 812 Rough Stop Cocks

Brass, with pipe threads, tee or lever handle. Nut and washer type. 1/2 to 2 in.



No. 250 Steam Cock

No. 250 Brass Steam Cocks

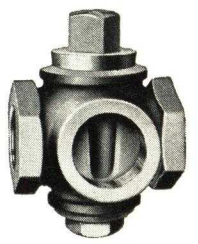
For steam working pressures up to 100 lbs. Square head. Sizes 1/4 to 4 in.



No. 80E Steam Cock

No. 80E Extra Heavy Steam Cocks

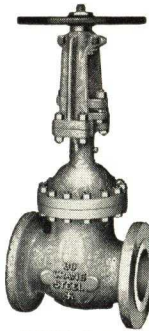
Bronze, square head. For steam working pressures up to 250 lbs. 1/4 to 3 in.



No. 326 Iron Three-Way Cock

No. 326 Iron Three-Way Cocks

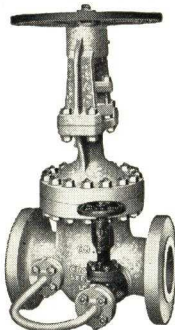
All-iron, screwed connections. For liquid working pressures up to 125 lbs.



No. 33XN Gate Valve

No. 159X Cast Steel Flanged Swing Check Valves, Series 30

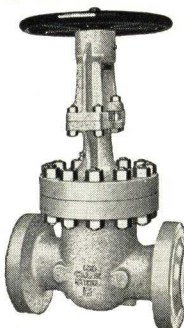
For working pressures as follows: 300 lbs. at 750° F. 500 lbs. non-shock at atmospheric temperatures. 400 lbs. boiler feed.



No. 78XN Wedge Gate Valve

No. 171XN Cast Steel Globe Valves, Series 60

For working pressures as follows: 600 lbs. up to 850° F.; 550 lbs. up to 900° F. 750 lbs. boiler feed. 1200 and 750 lbs. non-shock at atmospheric temperatures, depending on size.



No. 87XN Gate Valve

*No. 163XN Cast Steel Angle Valves

Piston type, guided disc. For working pressures as follows: 400 lbs. up to 750° F. 500 lbs. boiler feed and 800 lbs. non-shock at atmospheric temperatures.

No. 33XN Cast Steel Gate Valves, Series 30

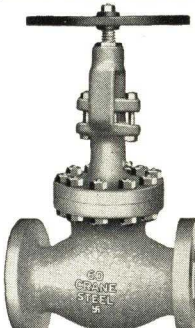
For working pressures as follows: 300 lbs. at 750° F.; 225 lbs. at 900° F. 500 lbs. non-shock at atmospheric temperatures. 400 lbs. at boiler feed.



No. 159X Swing Check Valve

No. 78XN Cast Steel Wedge Gate Valve, Series 60

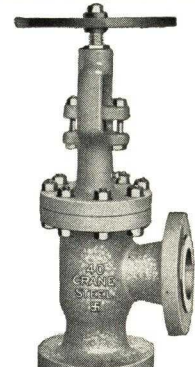
Body, bonnet and yoke, steel. Seating surfaces, Exelloy against Nitralloy. Stem, Exelloy. For 600 lbs. steam working pressures up to 850° F.; 550 lbs. up to 900° F. 750 lbs. boiler feed. 1200 lbs. non-shock atmospheric temperatures.



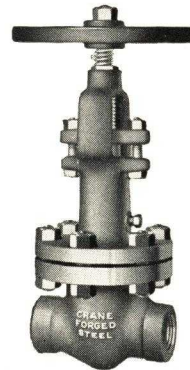
No. 171XN Globe Valve

No. 87XN Cast Steel Gate Valves, Series 150

For working pressures as follows: 1500 lbs. up to 850° F.; 1350 lbs. up to 900° F. 1800 lbs. boiler feed. 3000 lbs. non-shock at atmospheric temperatures.



No. 163XN Angle Valve



No. 176P Globe Valve

No. 80XN Forged Steel Gate Valve

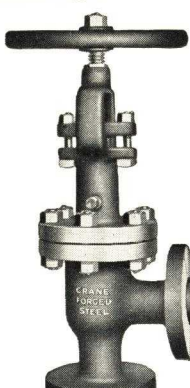
For super-heated steam, boiler feed and general service. Working pressures: 900 lbs. up to 750° F. 3000 lbs. non-shock at atmospheric temperatures.



No. 216P Globe Valve

No. 198 1/2 X Forged Steel Angle Check Valves

For 600 lbs. working pressure up to 750° F. Bolted bonnet and Exelloy trimmings.



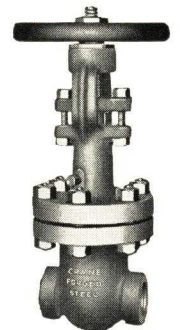
No. 197P Angle Valve

No. 178X Forged Steel Check Valves

Bolted bonnet, Exelloy trimmings. For working pressures up to 900 lbs. to 750° F. 3000 lbs. non-shock at atmospheric temperatures.

No. 176P Forged Steel Globe Valve

Plug type disc. For 900 lbs. steam working pressures up to 750° F. For 1100 lbs. boiler feed. For 3000 lbs. non-shock air or gas pressure at atmospheric temperatures.



No. 80XN Gate Valve

No. 216P Forged Steel Globe Valve

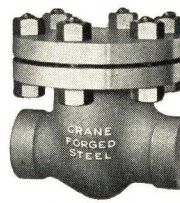
Plug type seat and disc; outside screw and yoke bonnet; flanged gland and screw packing nut. For 3000 lbs. non-shock cold water or oil working pressures. For 600 lbs. at 750° F.



No. 198 1/2 X Angle Valve

No. 197P Forged Steel Angle Valves

Plug type disc. For 600 lbs. steam working pressure up to 750° F. For 750 lbs. boiler feed. For 1200 lbs. non-shock water, air or gas working pressures at atmospheric temperatures.



No. 178X Check Valve

CRANE FITTINGS

Accuracy of angle and machining speeds installations, saves costs. Searching inspections assure dependable materials.



Extra Heavy Cast Iron Ell



Standard Malleable Iron Street Ell



Heavy Malleable Iron Tee



Standard Cast Iron Cross



Extra Heavy Cast Iron Elbow



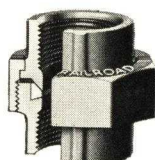
Series 40 Cast Steel Tees



No. 512 Gem Union

No. 512 Gem Union

High grade, light weight for steam, water, gas, or oil. Malleable iron, with iron to brass seats, eliminating gaskets and preventing corrosion.



No. 519 Railroad Union

No. 519 Railroad Union

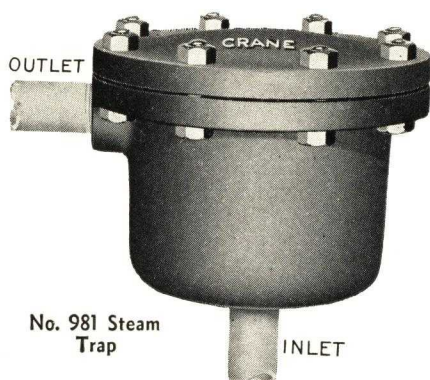
Heavy malleable iron, with iron to brass seats, ground joint.



No. 250H Union

No. 250H Union

With brass to steel seat. For 600 lbs. pressures up to 600° F. 2,000 lbs. non-shock pressures at atmospheric temperatures.



No. 981 Steam Trap

No. 981 Open Float Steam Trap

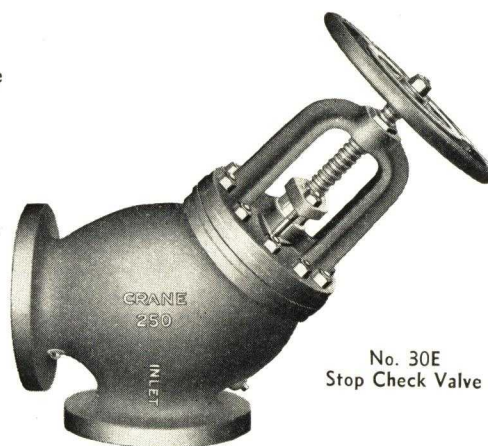
Made in 1/2, 3/4 and 1-in. sizes to drain steam units. Condensation, flowing into the trap, is automatically discharged through a valve at the top when the body is full; then the float becomes buoyant and closes the valve. This cycle of operation is so quick that all danger of wire drawing is practically eliminated.



No. 1116 Safety Valve

No. 1116 Outside Spring Pop Safety Valve

Built to A.S.M.E. boiler code requirements. Extremely large discharging capacity. Permits close regulation of the blow-down. Sizes 1 1/2 to 4 1/2 ins.



No. 30E Stop Check Valve

No. 30E Stop Check Valve

Accessible for internal examination without removing from pipe line. Noiseless under all loads. Will not pound, spin, or wear. Of cast steel with Monel disc, seat and stem for super heat.



No. 90 Direct Return Cranetilt Steam Trap

No. 90 Direct Return Cranetilt Steam Trap

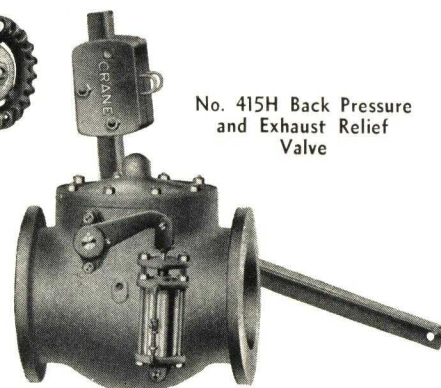
Delivers condensation and feed water to boiler at temperatures as high as that of water in boiler. Operates up to 250 lbs. boiler pressure. Durable, economical, simple. The tank tilts at each operation so that the working of the trap is always visible.



No. 960 Pressure Regulator

No. 960 Pressure Regulator

For saturated steam or air working pressures up to 250 lbs. For superheated steam at not higher than 500° F.



No. 415H Back Pressure and Exhaust Relief Valve

No. 415H Back Pressure and Exhaust Relief Valves

Stay open type. Iron body, brass mounted. For condensing or non-condensing engines.

CRANE WELDING FITTINGS

Engineers are turning to Crane welding fittings for economy of time and money. They are precisely machined, accurately beveled, and shaped for every possible need.



No. 352E
Welding Elbow



No. 353E
Welding Tee



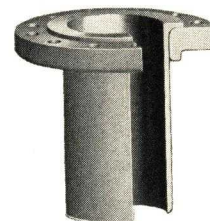
No. 354E
45° Welding
Elbow



No. 355E Welding Return
Elbow



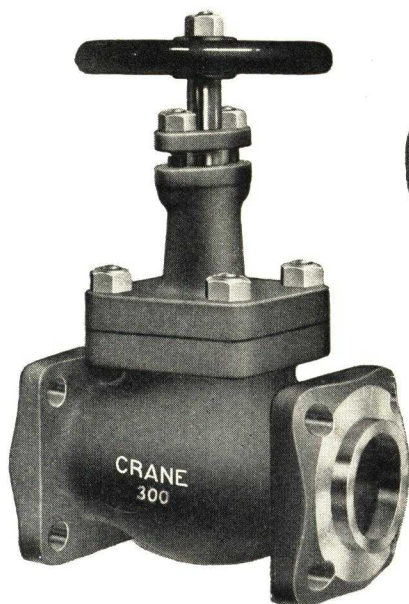
No. 296E Welding Flange



No. 574E Welding Nipple
and
No. 496E Cranelap Flange

Crane Valves and Fittings for Ammonia, Air, Gas, Chemicals

Of Ferrosteel, with special metal discs in valves, for working pressures up to 300 pounds.



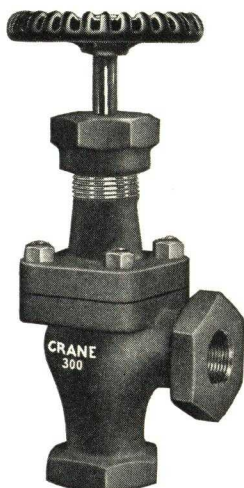
No. 1501 Globe Valve



No. 1506 1/2 Check Valve



No. 1521 Elbow



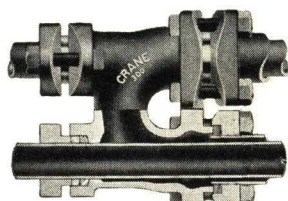
No. 1505 Angle Valve



No. 1527 Cross



No. 1530
Elbow



No. 1575 Return Bend

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Crane facilities and experience insure uniformity in bends and exactness in measurements in fabricated piping and coils for all purposes.



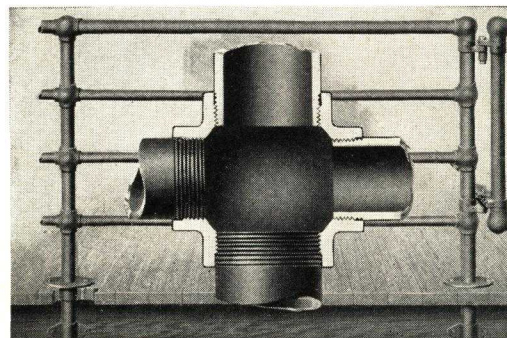
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Coils Built to Specifications



Railings Fabricated to Meet Conditions Specified

THE EDWARD VALVE & MANUFACTURING CO.

EAST CHICAGO, IND.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Products

VALVES: Globe, Angle, Non-Return, Blow-off, Check, Drumhead, Atmospheric Relief and Bleeder Line Stop-Check Valves. Made with bodies and bonnets of forged steel, forged chrome nickel steel, electric cast steel, electric cast chrome nickel steel, other alloy steels, semi-steel, and



Ferac (high strength cast iron). Trimmed with EValloy (stainless), EValnite (Nitralloy as processed by Edward), "18-8," Stellite, Monel, Bronze and other alloys. For pressures of 150 lb. at 450° F. total temperature up to 2000 lb. at 1000° F. total temperature, also for hydraulic pressures up to 15,000 lb.



Fig. 2688

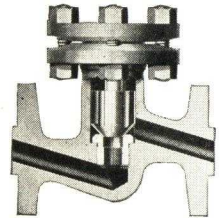


Fig. 2858

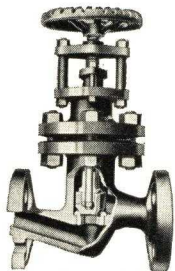


Fig. 2828

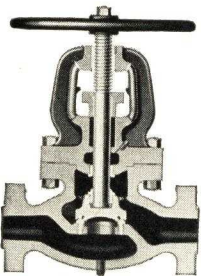


Fig. 3518

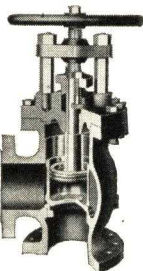


Fig. 2305

Globe and Angle Stop Valves

Figs. 2688 and 2828—Screwed end and flanged end globe valves are representative of the Edward forged steel line of globe and angle valves. Seat and disk of either EValloy or EValnite (as desired or as service conditions warrant), stem of EValloy. Same design for pressures up to 2000 lb. at 1000° F. total temperature. Used extensively in steam power plants and oil refineries. Made in sizes $\frac{1}{4}$ to 2 in., inclusive.

Fig. 3518—Globe valve, one of the cast steel line of globe and angle valves. Body and bonnet of electric cast steel or electric cast chrome nickel steel with EValloy or EValnite trimmings. Larger sizes have EValthrust double combination radial and end thrust ball bearing yoke for easy operation. Made in sizes 2 to 16 in. for pressures of 250 lb. at 450° F. total temperature up to 2000 lb. at 1000° F. total temperature.

Non-Return Valves (Globe, Angle and Elbow)

Figs. 2305 and 3505—The 250 lb. and 1500 lb. working steam pressure non-returns. Noiseless, easy of operation and maintenance, full area through all passages, slanting diaphragms, low pressure drop, impactor type (patented) handwheels on larger sizes for easy closing against boiler test pressures, are a few of the features of the Edward design in this essential boiler equipment. Made in sizes 2 to 16 in. in all types and for all pressures and temperatures now in use in modern steam power plants.

Blow-Off Valves (Globe, Angle and Straightway)

Edward blow-off valves are of the slow opening screw stem type particularly satis-

factory for this severe service in the higher pressure ranges. Usually installed in tandem. Made of forged steel, cast steel and semi-steel, with EValloy stem, EValnite or EValloy seat and disk, for working steam pressures of 250 lb. at 450° F. total temperature up to 2000 lb. at 1000° F. total temperature. (Figs. 741 and 3568.)

Check Valves

"Piston Type," non-shock, tight seating, noiseless, disk cushioned throughout its travel. Made for working steam pressures of 250 lb. at 450° F. total temperature up to 2000 lb. at 1000° F. total temperature. (Figs. 2678, 3597 and 2858.)

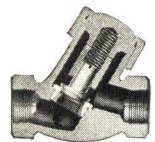


Fig. 2678

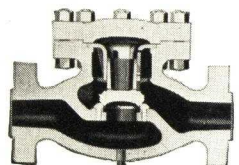


Fig. 3597

Drumhead Valves

Figs. 2550, 3548 and 2746—Combination stop-check valves for feed line service. Elimination of a joint in combining stop valve and check valve in one body. Made for all pressures from 250 lb. to 2000 lb.

Atmospheric Relief Valves

Fig. 293—Designed for either hydraulic operation or hand operation in two types—the turbine type without piston for small turbines, and the piston type for large turbines or reciprocating service. Positive and automatic opening. Full discharge capacity through all passages. Light weight disks which are fully guided throughout their travel. Made in sizes 6 to 48 in.

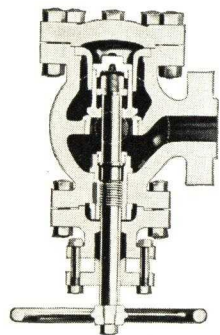


Fig. 3548

Bleeder Line Stop-Check Valves

Noiseless, piston type, easy of operation and maintenance. Made in sizes 6 to 24 in.

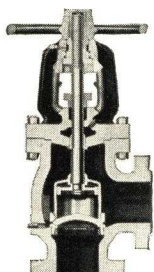


Fig. 3505

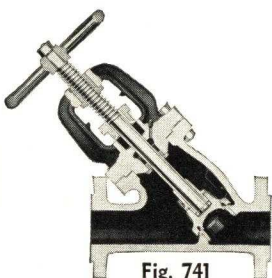


Fig. 741

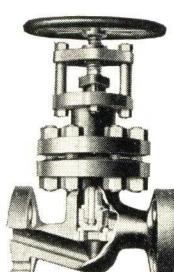


Fig. 3568

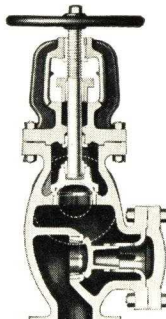


Fig. 2550

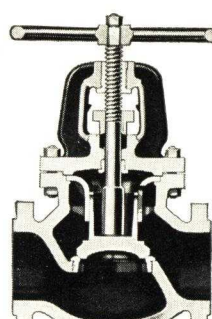


Fig. 2746

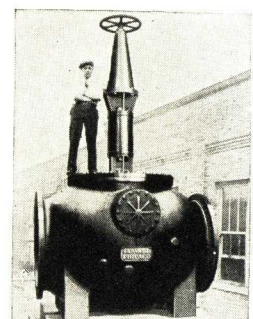


Fig. 293

HANCOCK VALVE DIVISION

CONSOLIDATED ASHCROFT HANCOCK COMPANY
INCORPORATED

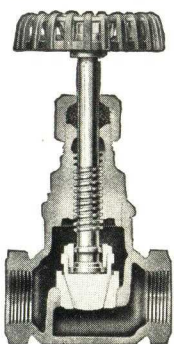
BRIDGEPORT, CONN.

CONSOLIDATED SAFETY VALVE DIVISION HANCOCK AND METROPOLITAN INJECTOR DIVISION
AMERICAN SCHAEFFER & BUDENBERG DIVISION ASHCROFT AMERICAN GAUGE DIVISION

Hancock Bronze Globe and Angle Valves

Hancock High Pressure Bronze Globe Valves are made in $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$ and 3-in. sizes.

These valves are good for 300 lb. steam pressure to 550° F. and for 500 lb. water pressure to 100° F. They are made with screwed or flanged ends to 250 lb. standard, and with standard bonnet or outside screw and yoke bonnet.



There are three types of Hancock Valve Seats, the standard flat seat, the bevel seat and the well-known Hancock Cone Seat. The seats and discs are made of MMM metal, a high nickel alloy of exceptional strength and hardness. The Hancock Cone Seat Valve won't leak. Every cone is ground and lapped into its own seat. This insures a perfect fit. The cone seat is particularly recommended for severe service or for any

throttling service where an ordinary valve leaks.

Hancock Angle Valves are made in the same sizes as globe valves. The illustration shows a typical angle valve with screwed inlet and screwed outlet and outside screw and yoke bonnet, for steam pressures to 300 lb. Send for Catalogue WA-37.



flanged ends. Made in sizes $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ and 2 in. Made with renewable seat and disc of MMM, a high nickel alloy of exceptional strength and hardness. Every valve tested before shipment at sufficient pressure to guarantee a sound factor of safety and at a minimum of 1000 lb. hydraulic pressure. Send for Catalogue W-37.



Hancock Bronze Gate Valves

Hancock Gate Valves are of extra heavy construction for 300 lb. steam pressure. They are made with screwed ends in following sizes: $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$ in. Flanged ends furnished in following sizes: 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$ and 3 in.

Valves have renewable seats, double wedge discs and rising stem. May be packed under pressure when wide open.

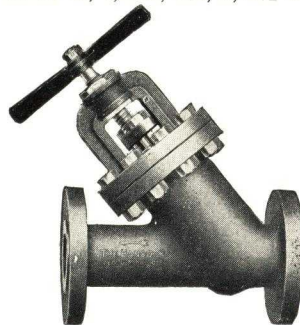
Hancock Forged Steel Check Valves

Hancock Forged Steel Globe Check Valve for steam pressures to 650 lb. with flanged cap and flanged ends. Also made with screwed ends with union cap and with flanged cap in $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2-in. sizes.



Hancock Cast Steel Valves

Hancock Cast Steel Valves are made for steam pressures to 650 lb. in 250, 400 and 600-lb. standards in $1\frac{1}{2}$ -in. to 6-in. sizes. Illustration shows 400-lb. cast steel angle valve with flanged outside screw and yoke bonnet and flanged ends. Globe and angle valves made also with screwed ends and screwed bonnet and with screwed ends and outside screw and yoke bonnet in $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$ and 3-in. sizes.



Hancock Bronze Check Valves

Hancock Bronze Check Valves are made in the following sizes: $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$ and 3 in. The renewable seat and disc are MMM, a high nickel alloy of exceptional strength and hardness. Illustration shows Hancock Swing Check Valve. Also globe checks, screwed and flanged.



Hancock Forged Steel Globe Valves

Hancock Forged Steel Valves are made for steam pressures to 1350 lb. in 400, 600, 900 and 1350-lb. standards. Illustration at left shows a 400 lb. forged steel globe valve, union bonnet type with screwed ends. Made in the following sizes: $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ and 2 in. Seats and discs are made of MMM, a high nickel alloy of exceptional strength and hardness. The Hancock Cone Seat is recommended for severe service.

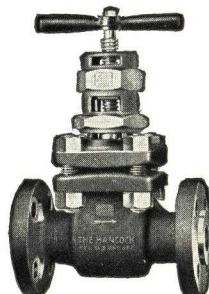
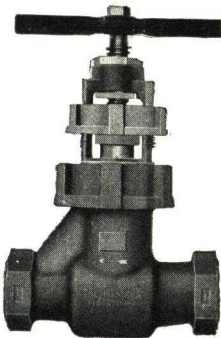
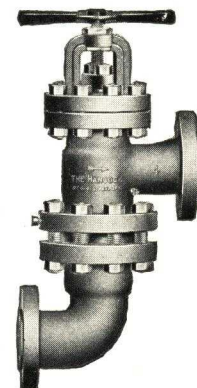


Illustration at right shows a Hancock Forged Steel Globe Valve for steam pressures to 1350 lb. with flanged bonnet and

Hancock Blow-off Valves

Hancock Cast Steel Blow-off Valves are made in angle type and straightway type as illustrated in 250, 400 and 600-lb. standards. Sizes: $1\frac{1}{2}$, 2 and $2\frac{1}{2}$ in.



Hancock Drumhead Stop and Check Valves

Drumhead Stop and Check Valves made in bronze and cast steel with screwed, straightway inlet or quarter turn inlet, and with screwed or flanged outlet. Bronze for 250-lb. standard and cast steel to 400 and 600-lb. standard. Sizes: $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3 and 4 in. Also cast steel stop-check valves in 400 and 600-lb. standards in 2, $2\frac{1}{2}$, 3 and 4-in. sizes. Send for Catalogue WC-37.

HOMESTEAD VALVE MANUFACTURING CO.

Manufacturers of Valves and Other Specialties for More Than Forty Years
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ROUND PORT VALVES: Acid Resisting, Steel or Semi-Steel.

BLOW-OFF VALVES, HOVALCO-HOMESTEAD COMBINATION BOILER.

AIR SHUT-OFF VALVES, HOMESTEAD ROSS.

HYDRAULIC OPERATING VALVES, HOMESTEAD PROTECTED SEAT (B. & O. Patents).

HYPRESSURE JENNY: Vapor Spray Cleaning Machine for cleaning floors, walls, windows, machinery and all dirty greasy equipment.

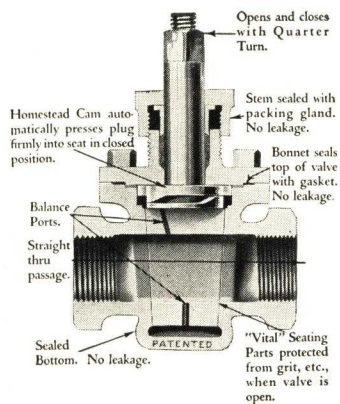
VALVES of *Special Design* or of *Special Material* will be made in quantity to meet your requirements.

Write for New Valve Reference Book No. 36.

Principle of Homestead Quarter-Turn Valves

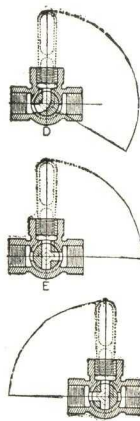
The plug is kept in its seat by a cam which is allowed a vertical movement of only a few thousandths of an inch. Although held down, the plug turns freely, but a quarter-turn in the closing direction brings the slope on the upper part of the plug in contact with the slope on the cam. Further effort to turn the plug in the closing direction serves only to force it more firmly into its seat.

A slight motion in the opposite direction, however, immediately releases the pressure against the slopes of the cam and the plug turns easily, being stopped at the proper position by co-acting surfaces provided for the purpose.



Homestead Quarter-Turn Valves are made in all sizes up to 12 ins., straightway, threeway, and fourway types and cast in metal such as brass, semi-steel, steel, acid resisting bronze, monel metal and other metals suitable for the conditions under which they are used.

In certain sizes and types they are designed for working pressures up to 3000 lbs., and tem-



Horizontal Sections of Threeway Valves

perature ranges can be handled up to 750° F.

When ordering any type of Homestead Quarter-Turn Valve please be sure to give the size of valve required, the temperature and pressure under which it is to be used and the fluid that is to be handled. If threeway valves are ordered, please specify style of port arrangement desired from the small sketches shown—for example, specify Style D, E, or F.

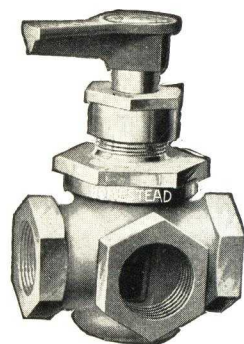


Fig. 9. Homestead Threeway Valve

Lift-Type Valves—Turn Freely—Close Tightly

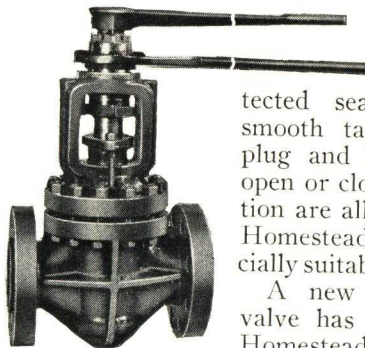
Large plug valves can now be operated easily under high pressures with the new Homestead lifting feature. In fact, the hardest valve jobs in your plant—jobs on which all other valves have stuck or have given some other form of operating trouble—are now made easy by Homestead Lift-Type Valves.

Jobs which require valves to remain open or closed for long periods of time under the action of corrosive and erosive fluids, or possibly subject to the operating obstacles of high temperatures, infrequent operation and corrosion, or jobs which require the operation of large sized valves under high pressures, are all jobs on which Homestead Lift-Type Valves give ease of operation and

absolute control of the fluid in the line.

Positive lifting, positive seating, protected seating surfaces, straight smooth tapered passages through plug and body, a quarter-turn to open or close, and rugged construction are all advantages which make Homestead Lift-Type Valves especially suitable for your requirements.

A new single handle lift-type valve has just been perfected by Homestead engineers—write for complete facts.



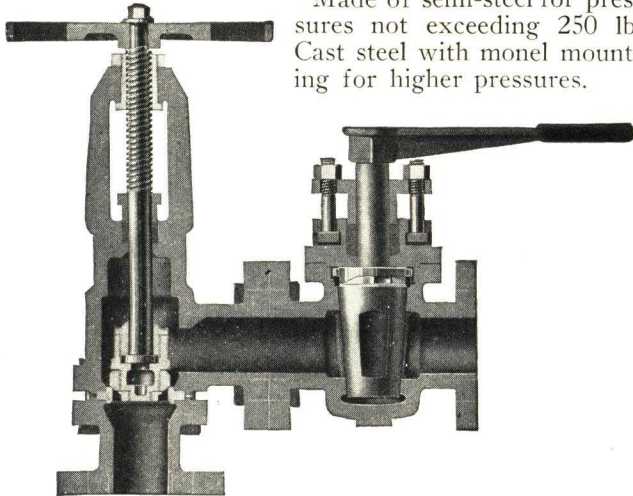
Lift-Type Valve

"Hovalco Homestead" Combination Blow-off Valves

For 250 and 400-lb. working pressures. The double blow-off arrangement represents the accepted practice in hundreds of power plants and meets the requirements of the A.S.M.E. Code and those States where two valves are specified on the blow-off line.

In addition to the characteristic advantages of the individual valves, this combination makes it possible, if used in the proper manner, to regrind, renew or reverse the seat and disc of the "Hovalco" blow-off valve while the boiler is under pressure.

Made of semi-steel for pressures not exceeding 250 lb. Cast steel with monel mounting for higher pressures.



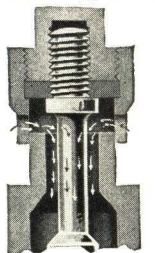
"Hovalco" Blow-off Valve Homestead Quarter-Turn Valve
Fig. 51. "Hovalco Homestead" Combination Blow-off Valve

Homestead Protected Seat Hydraulic Operating Valves (B & O Patent), 1500 and 3000 Lbs. Pressure

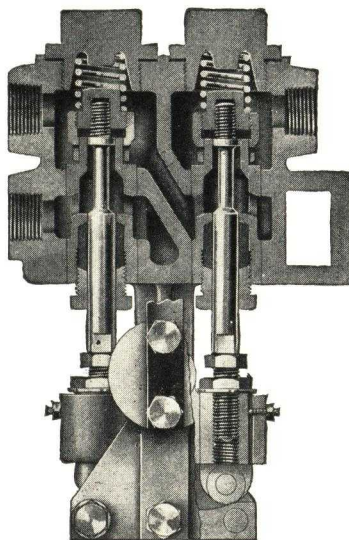
The protected seat principle is applied to the hydraulic operating valve in the manner shown in the sectional view of the three-way valve. Composition discs seating on a metal collar are used in place of leather cups or ground metal joints.

The construction of the valves is so simple that the fibre discs may be changed very quickly when required. That this is seldom necessary (length of uninterrupted services of one year being normal) is due to the protecting sleeve and plunger which eliminates the high velocity of the fluid as it passes the seating elements, reducing wire drawing to a minimum, and tending to cushion the closing of the valve to prevent pounding and crushing of the fibre discs.

Bronze valves are now available in three-way or four-way types in $\frac{1}{2}$, $\frac{3}{4}$, 1 and $1\frac{1}{4}$ -in. sizes.



Enlarged View of Protected Seat



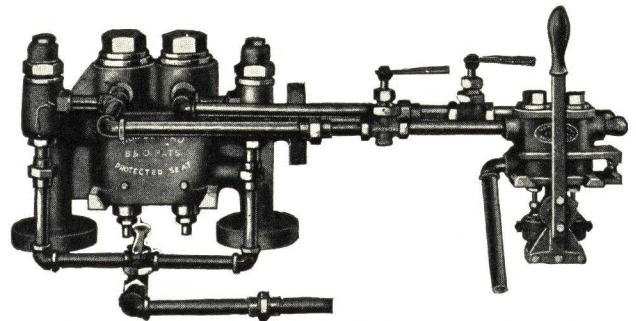
Sectional View of the Three-way Type
Homestead Protected Seat Hydraulic Operating Valve

Homestead Hydraulic Operating Valves (Remote Control)

When made in larger sizes the Homestead protected seat operating valve is controlled by a smaller direct connected pilot valve. Both are constructed with the Homestead protected seat feature.

The remote control is entirely hydraulic. There is no intermediate cylinder mechanism, linkage or other mechanical force translation. The main valve responds instantly to the touch of the pilot valve lever, yet the construction of the remote control feature is such that the large valve closes without waterhammer. The pilot valve is easily controlled—its stroke short and the force necessary to operate only a few pounds. The operator does not become fatigued even if he is operating three or four valves continuously. These valves are used for the most severe services such as blooming mill manipulators, bull dozers, hot saws, bloom shears, etc. They are made in $1\frac{1}{2}$, 2 and $2\frac{1}{2}$ -in. sizes.

Our Engineering Department is at your service on problems of hydraulic control.



Homestead Hydraulic Operating Valve (Remote Control)

Hydraulic Spray Valves

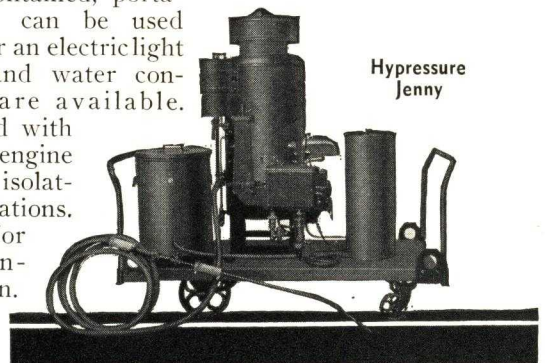
Single poppet type protected seat hydraulic operating valves are made in hand operated types sizes $\frac{1}{2}$ to $1\frac{1}{4}$ in. and in remote control types from $1\frac{1}{2}$ to 8 in., for use as control valves on hydraulic spray systems in steel mills.

Write for special Spray Valve Folder giving much valuable information on the hydraulic method of descaling hot steel.

Hypressure Jenny—"Cuts Cleaning Costs"

Hypressure Jenny is a new invention for a multiplicity of uses. It properly combines heat, pressure and cleaning compound, to cut the cost of cleaning grease, grime, tar, etc., from any surface, engine, machine, or building. It also sterilizes and disinfects.

Hypressure Jenny is a water vapor cleaning machine having a boiler capacity of more than 10 hp. It requires no licensed engineer or boiler inspection. It is self-contained, portable and can be used wherever an electric light socket and water connection are available. Equipped with gasoline engine drive for isolated installations. Write for more information.



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LONDON OFFICE: 6 Great Queen Street, Kingsway, W. C. 2

Products

VALVES: Globe, Angle, Cross, Check, Hose, Blow-off and Safety Valves; Rapid Action Valves, Quick-opening Valves; Needle Valves; Radiator Valves in a variety of types; Air Valves; Medium Pressure Globe and Angle Valves, in Bronze and Iron; Extra Heavy Valves for high pressures, in Globe, Angle, Cross, Check, Blow-off, Automatic Equalizing Stop and Check, and other patterns; Gate Valves in standard, medium and extra heavy patterns, Solid Wedge, or Double Disc; Valves in Bronze and Iron for all pressures and purposes; Bronze Fire Line Angle Valves; Cast Steel Gate Valves, Series 15 and 30; Underwriters' Hose Gate Valves; Bronze and Iron Body Regrinding Valves. Also Air Guns and Gauge Cocks. Jenkins Discs, Sheet Packing, Gasket Tubing, Ready Cut Gaskets, and other Mechanical Rubber Goods.



Guaranteed for 200 lbs. steam working pressure or 300 lbs. oil, water, gas working pressure.

Jenkins Bronze Fire Line Angle Valves

Fig. 715-A—719-A for 150 lbs. water working pressure.

Fig. 715-B—719-B for 250 lbs. water working pressure.

Size: 2½ in.
Fig. 715-A and 719-A are for Class A service, for buildings not exceeding 300 ft. in height or for the uppermost 300 ft. in any building; Fig. 715-B and 719-B are for Class B service, for buildings exceeding 300 ft. in height except in the uppermost 300 ft. as previously described. These valves have been approved by the Board of Standards and Appeals of the City of New York.



Fig. 719-B

Fig. 719-A

Screwed Outlet

Fig. 715-A

Fig. 715-B

Hose Outlet

Jenkins Standard Bronze Globe, Angle and Cross Valves

With one-piece screw-over bonnet and slip-on stay-on disc holder.

For 150 lbs. steam working pressure or 250 lbs. oil, water, or gas working pressure. Sizes: Screwed, ¼ in. to 3 in.; Flanged, ¼ in. to 3 in.

Trimmings of globe, angle and cross valves, screwed or flanged, are interchangeable part for part, size for size. (See Fig. 106-A.)



Fig. 106-A

Globe, Screwed

Fig. 108-A

Angle, Screwed

Fig. 110-A

Cross, Screwed

Jenkins Standard Bronze Check Valves

For 150 lbs. steam working pressure or 250 lbs. oil, water, gas working pressure. Sizes: Screwed, ¼ in. to 3 in.; Flanged, ¼ in. to 3 in.

The parts of Fig. 117-A and Fig. 118-A are interchangeable, part for part, size for size.



Fig. 117-A

Horizontal Check, Screwed

Fig. 118-A

Angle Check, Screwed

Fig. 119

Vertical, Screwed

Fig. 352

Swing Check, Screwed

Jenkins Bronze Globe, Angle and Check Valves

For 250 lbs. steam working pressure. Sizes: Screwed, ¼ in. to 2 in.; Flanged, ½ in. to 2 in.

These valves are fitted with a Jenkins disc specially compounded to withstand steam working pressures up to 250 lbs. The Disc, being more resilient than metal, readily conforms to the metal seat and insures a tight valve without regrinding.

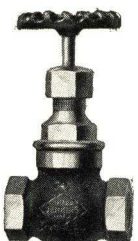


Fig. 128

Globe, Screwed

Jenkins Extra Heavy Bronze Globe, Angle, Cross and Check Valves

For 300 lbs. steam working pressure or 500 lbs. oil, water, gas working pressure. Sizes: Screwed, ¼ in. to 3 in.; Flanged, ½ in. to 3 in.

Jenkins Bronze Regrinding Globe, Angle, Cross and Check Valves

For 200 lbs. steam working pressure. Sizes: Screwed, ¼ in. to 3 in.; Flanged, ½ in. to 3 in. Also Regrind—Renew Patterns either with Renewable Nickel Alloy Seat Ring and Disc or Seat Ring and Plug, made in sizes ¼ in. to 2 in.

Jenkins Bronze Rapid Action Valves and Quick Opening Valves

For 150 lbs. water working pressure. Made in sizes up to 3 in.

These valves are for use on laundry washing machines, gasoline bulk terminals and other places where quick on and off operation is essential. These valves are spring closing. A short pull on the end of the spindle, forcing the disc holder off the seat. Fig. 712 and Fig. 720 have plunger and air chamber arrangement that prevents water-hammer and strain apparent when a flow of liquid is suddenly shut off.



Fig. 712

Quick-Opening Self-Closing Valve

Jenkins Bronze Y or Blow-off Valves

Standard Pattern—For 150 lbs. steam working pressure.

Sizes: Screwed, ¾ in. to 3 in.; Flanged, ½ in. to 3 in.

Extra Heavy Pattern—For 250 lbs. steam working pressure.

Sizes: Screwed, ½ in. to 3 in.; Flanged, ½ in. to 3 in.



Fig. 124

Standard Pattern, Screwed

Fig. 134

Extra Heavy Pattern, Screwed

Jenkins Bronze Gate Valves

Standard Pattern—

For 125 lbs. steam working pressure or 200 lbs. oil, water, gas working

pressure. Sizes, inside screw: Screwed, ¼ in. to 3 in.; Flanged, ¾ in. to 3 in. Sizes, O. S. & Y.: Screwed, ¾ in. to 3 in.; Flanged, ¾ in. to 3 in.

Jenkins Bronze Gate Valves have globe shaped body and double-faced solid wedge. Guides cast in body prevent chattering when valve is



Fig. 368

Outside Screw and Yoke, Screwed

partly open and keep wedge in line for perfect seating. When open, the wedge is entirely removed from the pathway of the flow.

Jenkins Medium Pattern Gate Valves—For 175 lbs. steam working pressure or 300 lbs. oil, water, gas working pressure. Sizes, inside screw: Screwed, $\frac{1}{4}$ in. to 3 in.; Flanged, $\frac{3}{4}$ in. to 3 in. Sizes, O. S. & Y.: Screwed, $\frac{3}{4}$ in. to 3 in.; Flanged, $\frac{3}{4}$ in. to 3 in.

Jenkins Extra Heavy Pattern Gate Valves—For 250 lbs. steam working pressure or 400 lbs. oil, water, gas working pressure. Sizes, inside screw: Screwed, $\frac{1}{4}$ in. to 3 in.; Flanged, $\frac{3}{4}$ in. to 3 in. Sizes, O. S. & Y.: Screwed, $\frac{3}{4}$ in. to 3 in.; Flanged, 1 in. to 3 in.

Jenkins Iron Body Globe, Angle, Cross Valves

These valves are bronze mounted with renewable bronze seat ring and Jenkins Composition Disc.

Standard Pattern—For 150 lbs. steam working pressure or 250 lbs. oil, water, gas working pressure. (See Fig. 141.)

Medium Pattern—For 175 lbs. steam working pressure or 250 lbs. oil, water, gas working pressure.

Extra Heavy Pattern—For 250 lbs. steam working pressure or 400 lbs. oil, water, gas working pressure.



Fig. 141
Globe, Screwed

Jenkins Iron Body Bronze Mounted Gate Valves with Hub Ends and Square Stem Nut

Double Disc or Solid Wedge

Conform to specifications of the American Water Works Association.

Double Disc or Solid Wedge—For 175 lbs. water working pressure. Tested to 300 lbs. hydraulic pressure. Sizes: 2 in. to 24 in.



Fig. 883



Fig. 327

Jenkins Iron Body Regrinding Globe, Angle, and Check Valves

For 150 lbs. steam working pressure, or 250 lbs. oil, water, gas working pressure. Sizes: $\frac{3}{8}$ in. to 2 in.

These valves are regularly furnished with renewable nickel-alloy seat ring and disc. Bronze or stainless steel seat ring and disc can be supplied if so specified. These valves are of the union bonnet type; the body of high test cast iron; the spindle of manganese bronze; the wheel of the ball-type enameled green.



Fig. 890
Globe

Jenkins Iron Body Check Valves

Standard Pattern—For 150 lbs. steam working pressure or 250 lbs. oil, water, gas working pressure.

Extra Heavy Pattern—For 250 lbs. steam working pressure or 350 lbs. oil, water, gas working pressure.



Fig. 151
Standard Pattern
Horizontal,
Screwed



Fig. 294
Standard Pattern,
Swing Check,
Screwed

Jenkins Iron Body Underwriters Gate and Swing Check Valves

For 150 lbs. water working pressure. Sizes: Gate Valves, 2 in. to 24 in.; Check Valves, 2 in. to 12 in.

Carry the approval of the National Board of Fire Underwriters and the Associated Factory Mutual Fire Insurance Companies, and are suitable for water working pressure up to 150 lbs. They are marked "FM" and "JU."



Fig. 825
Flanged Outside
Screw and Yoke

Jenkins Iron Body Bronze Mounted Y or Blow-off Valves

Standard Pattern—For 150 lbs. steam working pressure, or 250 lbs. oil, water, gas working pressure. Sizes: Screwed, 2 in. to 3 in.; Flanged, 2 in. to 3 in.

Extra Heavy Pattern—For 250 lbs. steam working pressure, or 400 lbs. oil, water, gas working pressure. Sizes: Screwed, 2 in. to 3 in.; Flanged, 2 in. to 3 in.



Fig. 296
Standard Pattern, Screwed

Jenkins Iron Body Bronze Mounted, Solid Wedge Gate Valves

Each of these Jenkins Iron Body Gate Valves is individually tested, identified and certified. Each is manufactured to the high standard of Jenkins quality which is your assurance of valve satisfaction.

Standard Pattern—2 to 16 in. for 125 lbs. steam working pressure; 200 lbs. oil, water, gas working pressure; 18 to 24 in. for 100 lbs. steam working pressure; 175 lbs. oil, water, gas working pressure. (See Fig. 325.)

Medium Pattern—For 175 lbs. steam working pressure or 300 lbs. oil, water, gas working pressure. (See Fig. 253.)

Extra Heavy Pattern—For 250 lbs. steam working pressure or 500 lbs. oil, water, gas working pressure.



Fig. 325
Inside Screw,
Screwed



Fig. 253
Outside Screw and
Yoke, Flanged

Jenkins Iron Body Bronze Mounted Double Disc Parallel Seat Gate Valves

Standard Pattern—For 200 lbs. oil, water, gas working pressure at 150° F.; 400 lbs. test pressure.

Extra Heavy Pattern—For 500 lbs. oil, water, gas working pressure at 150° F.; 1000 lbs. test pressure.

Jenkins Composition Discs

Made of finest ingredients, compounded and vulcanized with extreme accuracy. Numerous compounds, each suited for a particular service. Guaranteed when used in service specified.

Ready-reference Chart for Jenkins Discs—For cold water, air and gas up to 10 lbs. pressure, Disc No. 30; 10 to 25 lbs. pressure, Disc No. 15; up to 50 lbs. pressure, Disc No. 946; 50 to 250 lbs. pressure, Disc No. 936.

For cold water, 250 to 400 lbs. pressure, Disc No. 110. For hot water to 200° up to 50 lbs. pressure, Disc No. 936; 250° up to 250 lbs. pressure, Disc No. 110.

For hot water to 300°, Disc No. 80-A. For steam up to 100 lbs. pressure, Disc No. 80-A. For wet steam 150 lbs. pressure not over 366°, Disc No. 119.

For oil not over 100° to 50 lbs. pressure, Disc No. 946; not over 100°, 50 to 100 lbs. pressure, Disc No. 936; not over 150° to 200 lbs. pressure, Disc No. 1120. Temperatures recommended are Fahrenheit.

Jenkins Sheet Packing

Jenkins '96—Unvulcanized rubber sheeting for saturated steam joints under high or low pressure.

Jenarco—Red rubber sheeting, tough and pliable, suitable for steam, hot or cold water, etc.

Oilite—Specially compounded for joints in lines carrying gasoline, kerosene, crude oil, etc.

Thickness	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{4}$
Jenkins '96 regular	2 3/4	5 1/2	8 1/4	11	16 1/2	22 1/2
Jenkins '96 brass wire insertion	8	10 3/4	13 1/2	19	25	
Jenarco, regular	2 3/4	5 1/2	8 1/4	11	16 1/2	22 1/2
Jenarco, brass wire insertion	8	10 3/4	13 1/2	19	25	
Oilite, regular	2 3/4	5 1/4	7 7/8	10 1/2	15 3/4	21

Jenkins Pump Valves

A few of the Jenkins service-tested compounds:

No. 80—For hot water temperatures 180° to 300°.

No. 88—For warm water up to 175 lbs. pressure.

No. 93—For cold water pressures up to 175 lbs.

No. 94—For cold water, low pressures.

Jenkins Asbestos Jointing

For high pressure and superheated steam and other severe services. Proof against heat, steam, water, oils, acids, and alkalis.

THE KENNEDY VALVE MFG. CO.

ELMIRA, N. Y.

SALES OFFICES AND WAREHOUSES

NEW YORK, N. Y., 128-32 White Street

SAN FRANCISCO, CAL., 448-50 Tenth Street

CHICAGO, ILL., 1306-12 So. Canal Street

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EL PASO, TEX.

LOS ANGELES, CAL.
SALT LAKE CITY, UTAH

ATLANTA, GA.

EXPORT OFFICE: ELMIRA, N. Y.

General Features of Kennedy Valves

All valves and fire hydrants and brass or bronze fittings are tested.

The pressure ratings are conservative with liberal factors of safety at every point.

Direction of opening is counterclockwise unless otherwise ordered.



Guarantee

Kennedy products are thoroughly inspected before leaving the plant. Should defects develop in proper use, replacement will be made.

Catalogues

Complete catalogue will be sent on application.

Iron-Body Gate Valves



Fig. 47-D
Low pressure valve with flanged ends, inside stationary stem and clean-out pockets



Fig. 48
Low pressure valve with flanged ends and outside rising stem



Fig. 57
Standard valve with screwed ends and inside stationary stem

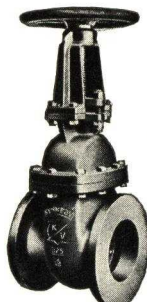


Fig. 61
Standard valve with flanged ends and outside rising stem



Fig. 119-C
Floor stand with stationary stem and graduated indicator

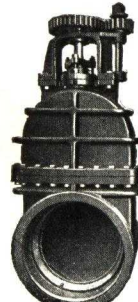


Fig. 56-A
Typical arrangement of gear-operated valve



Fig. 782-AG
Typical arrangement of electrically operated valve



Fig. 611-F
Typical arrangement of cylinder operated valve

Iron-Body Gate Valves (Continued)

Iron-body Bronze-mounted or All-iron. Furnished for operation by hand wheel, extended stem with floor stand, gears, cylinder or electric motor control. All types with inside stationary or outside rising stem. Double discs on all valves with various wedging mechanisms specially designed for services and pressures at which valves are to operate.

Low-pressure type can be furnished with back-outlet or clean-out pocket and with quick-operating stem or chain wheel. Standard type also in "quick-operating" and "Underwriters' Approved" styles, and can be furnished with by-pass. Medium and Extra-heavy types can also be furnished with by-pass.

Style	Ends	Sizes	Working pressures	
			Steam	Water
Low pressure	Flanged	14 to 60	15 and 25	35 and 50
Low pressure	Bell	14 to 60	15 and 25	35 and 50
Standard	Screwed, flanged or bell	1 1/2 to 12	125	175
Standard	Screwed, flanged or bell	14 to 16	125	150
Standard	Screwed, flanged or bell	18 to 60	100	120
Newtype	Flanged, bell or wood pipe	4 to 12	...	200
Newtype	Flanged, bell or wood pipe	14 to 60	...	150
Medium	Screwed or flanged	1 1/2 to 20	175	250
Extra Heavy	Screwed or flanged	1 1/2 to 20	250	350

Iron-Body Globe and Angle Valves

Iron-body Bronze-mounted or All-iron. Have outside rising stem and yoke, disc guide pin and guide in the seat which insures accurate seating and prevents rattling of the disc. Can be repacked under pressure when wide open.

Standard valves regularly supplied with a renewable composition or bronze faced regrounding disc.

Extra-heavy valves have discs with a lip or leader, which makes the seat self-cleaning and minimizes wire drawing; bosses to tap for drips.

All passages have full area and curves are long to reduce pressure losses.

Style	Disc	Sizes	Working pressures	
			Steam	Water
Standard	Bronze faced	2 to 12	125	175
Standard	Renewable	2 to 12	125	175
Medium	Bronze faced	2 to 12	175	250
Extra Heavy	Bronze faced	2 to 10	250	400



Fig. 56
Newtype heavy water valve with bell ends and inside stationary stem

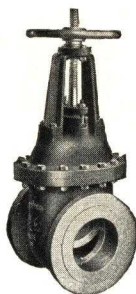


Fig. 75
Medium valve with flanged ends and outside rising stem



Fig. 761
Extra heavy valve with screwed ends and inside stationary stem

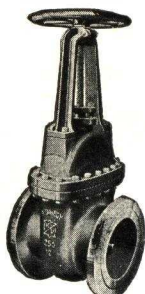


Fig. 77
Extra heavy valve with flanged ends and outside rising stem

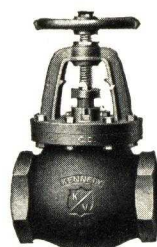


Fig. 435
Standard iron-body globe valve with screwed ends and renewable composition disc



Fig. 184
Medium iron-body angle valve with flanged ends

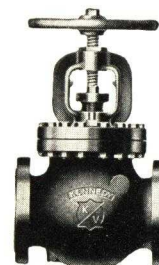


Fig. 863
Extra-heavy iron-body globe valve with flanged ends

Bronze Gate Valves

Screwed or flanged ends, malleable iron non-heating wheel, gland in stuffing box, and solid wedge disc guided by ribs cast in body, except in larger sizes, standard type, using double discs with parallel seats. Standard and medium types also furnished with outside rising stem and yoke. Standard type also made in "quick operating," "Underwriters' Approved" and hose styles, and can be supplied with waste drip, composition or bronze milled wheel, male union, and in special finishes and trimmings.

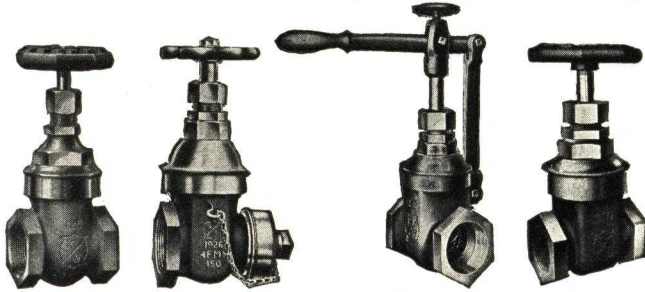


Fig. 27
Standard bronze gate valve with screwed ends

Fig. 39
Underwriters' approved hose gate valve with cap and chain

Fig. 36
Standard bronze quick-opening gate valve with screwed ends

Fig. 40
Extra-heavy bronze gate valve with screwed ends

Style	Disc	Sizes	Working pressures	
			Steam	Water
Low pressure	Solid wedge	1/4 to 2	100	175
Standard	Solid wedge	1/4 to 3	125	175
Standard	Double disc	3 1/2 to 6	100	150
Medium	Solid wedge	1/2 to 3	200	250
Extra Heavy	Solid wedge	3/8 to 3	250	350

Bronze Globe and Angle Valves

All styles have screwed ends and can be repacked under pressure when wide open. Renewable discs are of vulcanized composition which compresses to conform to any slight unevennesses of seat and makes a tight joint. For cold water, gas, air, etc., a special soft disc should be used and will be furnished when specified. Worn discs easily replaced and are interchangeable with those of "standard" dimensions. Regrinding types have bonnet secured by union ring and may be reground in place. Extra-heavy types have regrinding discs with throttling lip to protect seat face and renewable seat rings.

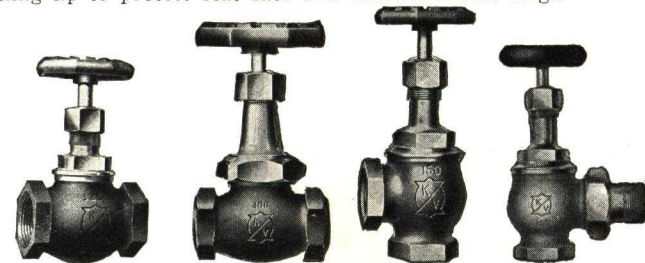


Fig. 150
Standard bronze globe valve with bronze disc

Fig. 544
Extra-heavy and high-pressure bronze globe valve with renewable bronze seat ring and disc

Fig. 92
Heavy bronze angle valve with renewable composition disc

Fig. 95
Heavy Government type radiator valve with unbreakable composition wheel and renewable composition disc

Style	Disc	Sizes	Working pressures	
			Steam	Water
Low pressure	Bronze	1/4 to 2	80	100
Standard	Bronze	1/4 to 3	125	175
Standard	Bronze	3 1/2 to 4	100	150
Standard	Br. Regrinding	1/2 to 2 1/2	125	175
Heavy	Composition	1/4 to 3	150	200
Medium	Br. Regrinding	1/4 to 3	200	250
Extra Heavy	*Br. Regrinding	1/4 to 3	300	500

*With bronze seat ring.

Bronze Check Valves

All types have screwed ends. Standard Swing type can be furnished with side plug one or both sides, also with leather faced disc for air and gases.



Fig. 103
Standard bronze swing check valve

Style	Disc	Sizes	Working pressures	
			Steam	Water
Low pressure	Swing	1/4 to 2	100	125
Standard	Swing	1/4 to 3	125	175
Standard	Regrinding	1/2 to 2	125	175
Standard	Vertical	3/8 to 2	125	175
Medium	Regrinding	1/4 to 3	200	250
Extra Heavy	Swing	3/4 to 3	250	400

Radiator Valves

Gate and Angle types with unbreakable composition wheels. Low-pressure angle valves with or without union for 80 lb. steam pressure, or Heavy Government type with gland, angle or corner offset with union for 150 lb. steam pressure.

Iron-Body Swing Check Valves

Iron-body Bronze-mounted or All-iron. Discs positive in operation and will not stick. Valves have direct passage of full pipe area, and may be used in horizontal or vertical pipe lines.



Fig. 106
Standard iron-body check valve with flanged ends

Style	Ends	Sizes	Working pressures	
			Steam	Water
Standard	Screwed, flanged or bell	2-12	125	175
Standard	Flanged or bell	14-16	...	150
Standard	Flanged or bell	18-24	...	120
Ex. Hvy.	Screwed or flanged	2-10	250	400

Kennedy-Erwood Swing Gate Valve

Swinging gate, controlled by spring on outside, may be adjusted to open automatically at desired back pressure. Gate is raised for unrestricted flow by handwheel. Principal applications: Back-pressure valve to atmosphere; atmospheric relief valve on turbines and condensing engines; safety-relief valve on exhaust lines of turbine pumps, hammers, elevators, etc.; non-return valve between turbines and condensers; non-return valve between open heaters and engines; safety pressure-balancing valve on air lines of air compressors; combined check and gate valve on discharge of pump. Sizes 1 1/2 to 24 in.

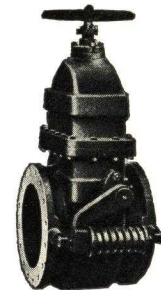


Fig. 708

High-Pressure Gate Valves for Oil, Gas or Water

400, 700, 1000 and 1600-lb. test gate valves. Iron-body Bronze-mounted or All-iron, with double discs and parallel seats, inside stationary and outside rising stem types, screwed or flanged ends. Also hydraulic gate valves for test pressures up to 2500 lb.

Kennedy-Pennie Back Water and Sewer Gas Valves

For sealing sewer or waste pipe against back water, vermin and gases. Bronze valve disc acts against machined bronze seat. Counterbalanced disc avoids resistance to outflow of sewage and ensures closure. Counterweighted with lead to suit position without removing valve or disc. For standard or extra heavy soil pipe. Sizes 2 to 12 in.



Fig. 55



"Safetop" Fire Hydrant

If accidentally broken by colliding vehicle, can be repaired within half an hour, by one man, without excavating or shutting off the water supply, and at a total cost of less than \$10.00

Fire Hydrants

"Newtype" and "Safetop" types. Compression type inlet valve centrally located with straight line action from operating nut and closes in direction of pressure. No flooding if top is broken. Double positive-action leather faced bronze drip valves completely drain standpipe and avoid freezing. Sizes 4, 4 1/2, 5 and 6 in. Standard depth of bury 5 ft. Other depths to order. Test pressure 300 lb. Main valve, seat ring, drip valve and drip valve seat easily removable without digging up hydrant.

Indicator Post Gate Valves

National Standard "Underwriters' Approved" type. Locking device wrench with staple on post regularly furnished. Oil hole in cover for lubricating stem. Post can be used on any approved valve. Sizes 4 to 14 in. Standard depth of bury 5 ft. Other depths to order.

Pipe Fittings

Malleable iron screwed fittings, galvanized or black, flat band and plain patterns. Brass or bronze screwed fittings, straight and reducing sizes. Cast iron flanged fittings for standard pressures, straight and reducing sizes. Cast iron companion flanges, standard and extra heavy pressures, also blind and reducing flanges.



Fig. 200
Cast iron flanged elbow



Fig. 301
Malleable iron screwed elbow

THE LUDLOW VALVE MANUFACTURING CO.

TROY, N. Y.

BRANCH OFFICES

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KANSAS CITY, MO., R. A. Long Building

BOSTON, MASS., 1112 Tremont Building
PITTSBURGH, PA., 422 Oliver Building
PHILADELPHIA, PA., Harrison Building

ATLANTA, GA.

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SALT LAKE CITY, UTAH

MONTREAL, QUE.

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FOREIGN AGENCIES
SYDNEY AND MELBOURNE, AUSTRALIA

BRUSSELS AND ANTWERP, BELGIUM

VALVES FOR STEAM, WATER, GAS AND OIL

Products

Double and Single Gate Valves;
Air, Check and Foot Valves;
Power Operated Valves; Complete line of Iron, Bronze
and Steel, designed for high, low, or medium pressures
of Steam, Water, Air, Natural Gas, Oil and Am-
monia. Fire Hydrants; Sluice
Gates.

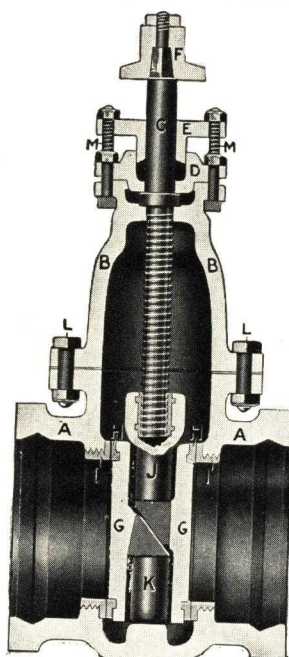


Fig. 70

Ludlow Bronze Mounted
Double Gate Valve

Ludlow Double Gate Straightway Valves

Internal mechanism consists
of stem, two gates and two
bevel faced wedges, the wedges
being entirely independent of
the gates and working between
them. (See Fig. 70.)

Construction—Metal used,
both iron and bronze, of high-
est grade. Gates cannot be
wedged or locked until they
are directly opposite valve
opening; stem cannot bind in
wedge; no stripping of thread
from stem by canting of gates
to either side.

All Ludlow Double Gate
Valves work equally well with
pressure either side of gate.
For detailed construction, see
diagram at side. This general
construction used in all Lud-
low Double Gate Valves.



Fig. 259

Screwed End,
Bronze Screwed
Packing Box and
Follower Nut
Style 2½ ins. and
under



Fig. 264

Flanged End Valve
with Bolted Packing
Plate and Follower
Style above 2½ ins.



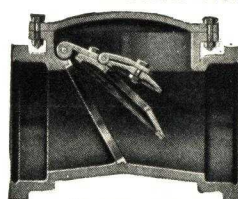
Fig. 14

Style of 6-in. Valve
with Loose Flanges
Bolted On

List No. 9. Sizes 1
in. to 14 ins. Working
pressures: 1200 lbs. for
Water, Gas and Oil

List No. 5¾. Working pressures: Steam,
125 lbs.; Water, Gas and Oil, 250 lbs.

Ludlow Horizontal Swing Check Valves



List No. 12

Horizontal Swing Check
Valve, Iron Body with
Bronze Mountings

These valves are heavy and sub-
stantial. They are so constructed that
the bottom of the case is flattened and
raised toward the seat, eliminating
pockets or receptacles for stones or
gravel. Gates
removable
through cover
plate. Sizes,
14 in. and
above are
made with by-
pass.

Ludlow Multi-Valve

Embodies the engineering principle of
multi-stage reduction now for the first time
successfully applied to valves.

Meets the requirements of high pres-
sures and temperatures in both expansible
and non-expansible fluids.

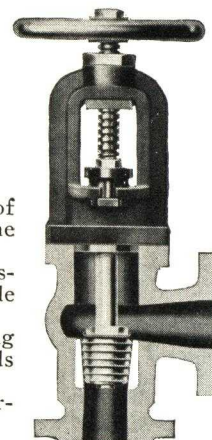
Affords a metal-on-metal multi-seating
that cuts through scale and viscous liquids
and insures a positive shut-off.

Is self-seating, as valve cleans and bur-
nishes its seat at each closing.

Erosion is eliminated by removing its
cause.

Fluids are controlled at new high pres-
sures and temperatures for existing mate-
rials.

Write for details.



Typical Ludlow
Multi-Valve,
Angle Type

Made also in
straightway and spe-
cial forms.



Fig. 5

Flanged End with
Bolted Packing Plate
and Follower

Style of sizes above
6 ins.



Fig. 96

Screwed End with
Bronze Screwed
Packing Box and
Follower Nut

Style 6 ins. and under



Fig. 102

Outside Screw and
Yoke Valve with
By-pass. Iron Body
with Bronze Mount-
ing or All Iron

Valves of List No.
5½. Sizes 1½ ins.
to 30 ins. Working
pressures: Steam, 250
lbs.; Water, Gas and
Oil, 400 lbs.

Valves of List No. 4 Sizes 1 in. to 12 ins.
Working Pressures: Steam, 100 lbs.; Water,
Gas and Oil: 150 lbs.

Ludlow Fire Hydrants

Ludlow List Nos. 75, 80, and 90. Thousands in use. List
No. 90, known as Ludlow Diamond, has body attached at
ground line—improved Slide Gate Valve. Furnished in several
sizes and types with various nozzle and hydrant connections.
Also Flush Hydrants, Yard Hydrants and Water Cranes.

YARNALL-WARING COMPANY

Manufacturers of Yarway Steam Specialties
7604 Queen Street. CHESTNUT HILL, PHILADELPHIA, PA.

BRANCH OFFICES
ATLANTA BOSTON CHICAGO CLEVELAND DETROIT KANSAS CITY NEW YORK PITTSBURGH
SALES REPRESENTATIVES (Names on Request)
DENVER HONOLULU LOS ANGELES MANILA PORTLAND, ORE. SAN FRANCISCO SEATTLE SPOKANE ST. PAUL TORONTO WINNIPEG

Yarway Products

BLOW-OFF VALVES IMPULSE STEAM TRAPS
HYDRAULIC VALVES EXPANSION JOINTS
AIR CONTROL VALVES SPRAY NOZZLES
WATER COLUMNS PIPE CLAMPS
WATER GAGES PIPE-JOINT CLAMPS
V-NOTCH METERS



TRADE-MARK

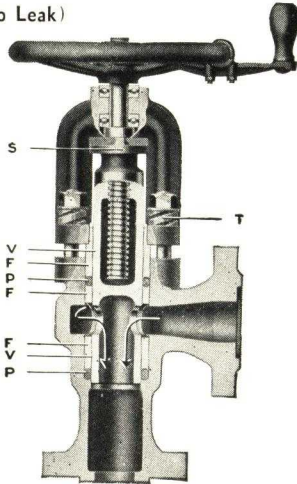
Yarway Seatless Blow-Off Valves

(No Seats to Leak)

Especially suitable for high pressure service. Used in over 10,000 plants.

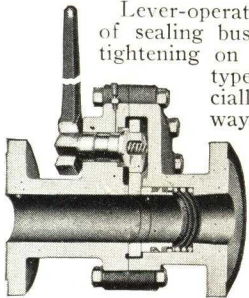
Operation—After valve has been closed, shoulder (S) on plunger (V) connects with upper follower gland (F), forcing this down into body and compressing packing (P) above and below port, making an absolutely tight valve. Yoke tension springs (T) maintain continuous compression on packing train. Write for *celluloid working model and Blow-off Valve Catalogue B-417*.

For Yarway Pretite Valves and Yarway Type P Seatless Valves for heating boiler service and for industrial process lines, send for *Bulletins P-501 and P-502*.



Yarway Double-Tightening Valves

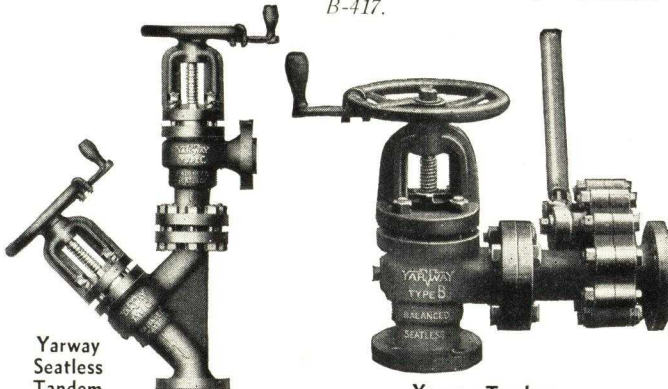
Lever-operated, swing gate type with unique feature of sealing bushing on inlet side, making it double-tightening on both sides of gate. Made in several types, for pressures to 300 lbs. and especially suited for use in tandem with Yarway Seatless Blow-off Valves. Write for *Bulletin B-417*.



Yarway Double-tightening Valve

Yarway Tandem Valves

The ideal combination for service on any blow-off line. Made in several types for pressures up to 2000 lbs. More of the new high-pressure plants are equipped with Yarway than with any other make of blow-off valves. Write for *Bulletin B-417*.



Yarway Seatless Tandem

Type for 400 to 600 lbs. working pressure

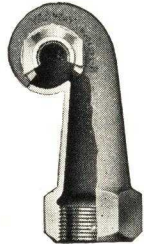
Yarway Tandem

Combining Yarway Seatless and Double-tightening Valves for pressures of 200 to 300 lbs.

Yarway Spray Nozzle

(Involute Types Klein Patents)

No internal vanes, deflector plates, or other parts to clog and wear. Inexpensive both in first cost and maintenance, and operates successfully under low pressure. Ideal for spray cooling and for many industrial spray requirements. Details of all types in *Bulletin N-613*.



Yarway Expansion Joints

(Wrought Steel, Cylinder Guided "Gun-Pakt")

An all steel guided expansion joint adaptable to practically every condition where expansion due to changes in temperature of high or low pressure steam mains, hot liquid lines, etc., must be met and overcome. Features recommending it for use in conduits and inaccessible locations are: (1) All steel welded construction—light and strong. (2) Cylinder guided, chromium



Yarway Cylinder-guided Expansion Joint
Double type with base. All-steel welded

covered steel sliding sleeve. Cylinder guide and stuffing box, integral, insuring perfect alignment. (3) Sliding

sleeve away from inside bottom of body dirt pocket. (4) Large deep stuffing box. (5) Easily accessible packing gland. (6) Diameter smaller than that of pipe flange. (7) Substantial internal limit stops.

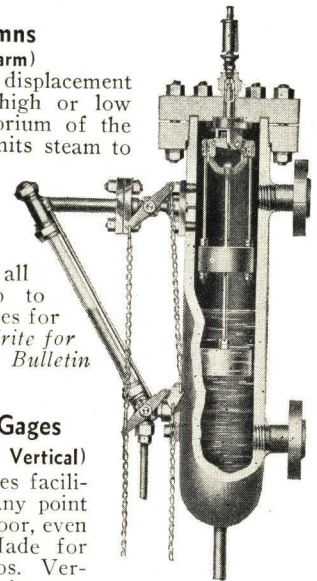
Made in standard and extra heavy types. Supplied with standard glands or with special "Gun-Pakt" glands which permit packing joints while under normal steam pressure. All sizes furnished in double type with base and in single type both with and without base. Small size joints also supplied in brass. Details of all types in *Bulletin EJ-1904*.

Yarway Water Columns

(With Floatless Hi-Lo Alarm)

Depends for its action upon displacement of solid weights. Whenever high or low water levels destroy the equilibrium of the weights, a valve opens and admits steam to the alarm whistle. If desired, a mercury electric switch connected to warning light or bell may be used instead of, or in connection with, the whistle.

Made in types for all boiler pressures up to 1350 lbs. Special types for higher pressures. Write for *working model and Bulletin WG-1802*.



Yarway Water Gages

(Se-Sure Inclined and Vertical)

Inclined water gages facilitate readings from any point on the boiler room floor, even directly beneath. Made for pressures up to 600 lbs. Vertical gages, using mica-protected flat glass steel inserts with drop forged cover plates, are equipped with a condensate guide which prevents erosion. *Bulletin WG-1802*.

Yarway Floatless Hi-Lo Alarm Water Column with Yarway Se-Sure Inclined Water Gage

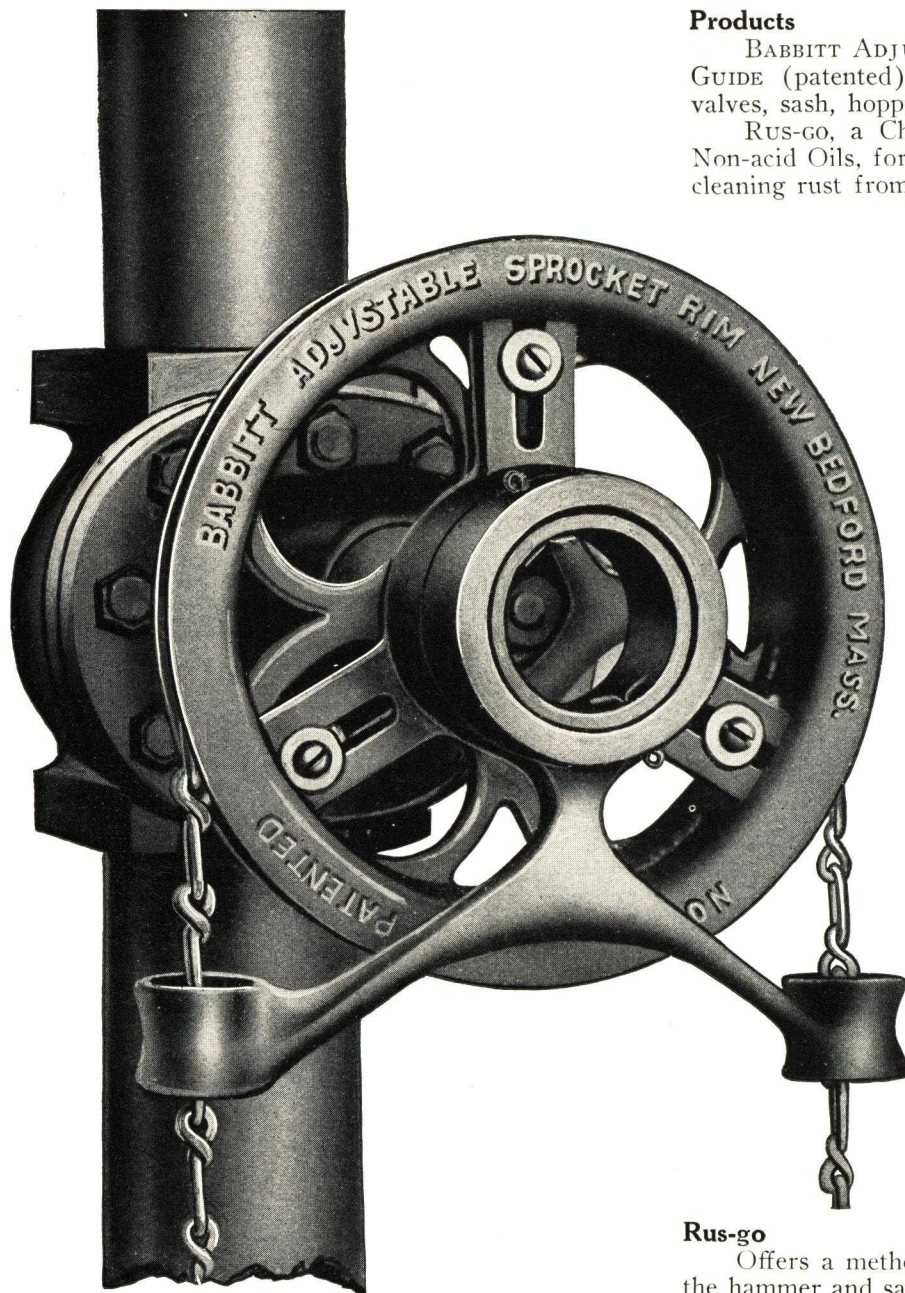
BABBITT STEAM SPECIALTY COMPANY

Manufacturers of Adjustable Valve Operating Mechanism
NEW BEDFORD, MASS.

Products

BABBITT ADJUSTABLE SPROCKET RIM with CHAIN GUIDE (patented) for opening and closing overhead valves, sash, hoppers, etc.

RUS-GO, a Chemical Combination of Rust-eating, Non-acid Oils, for loosening nuts, bolts, joints, and for cleaning rust from metals.



Babbitt Adjustable Sprocket Rim with Chain Guide

This universally adaptable device has met the demand for a dependable means of operating overhead or inaccessible valves of every make and description.

The Babbitt Rim fits any valve, any style, with either rising or non-rising stems, doing away with all clumsy apparatus and specially made chain wheels.

The use of the Babbitt Rim enables you to install valves where they should be, regardless of their accessibility.

There are ten standard sizes, applicable to the thousands of types and makes of valves. These are attached by clamping to the hand wheel now on the valve.

SIZES AND PRICES

Size No.	Diam. sprocket wheel, in.	Diam. valve wheels rim will fit, in.	Price list	
			Rim and guide combined	Rustproof chain, per ft.
0	4	2 to 4	\$2.40	\$0.08
1	5 7/8	4 1/8 to 5 7/8	4.00	.10
1 1/2	7 1/2	6 to 7 1/2	5.20	.10
2	9	7 3/4 to 9	6.40	.10
2 1/2	12 1/2	9 1/4 to 12 1/2	8.80	.16
3	15 1/2	12 3/4 to 15 1/2	10.80	.16
3 1/2	19	15 3/4 to 19	15.20	.16
4	22	19 1/4 to 22	20.00	.24
4 1/2	26	22 1/4 to 26	28.00	.24
5	30	26 1/4 to 30	32.00	.24

When ordering, give the diameter of the valve wheel to be fitted and number of feet of chain required. Also specify if valve has rising stem.

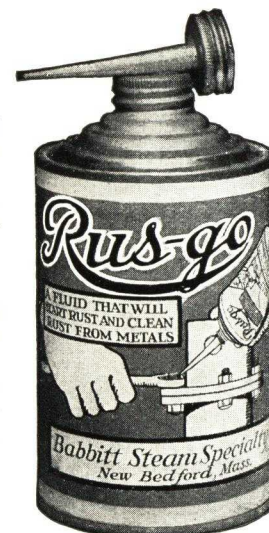
Rus-go

Offers a method of sparing the hammer and saving the part.

It is recognized by mechanics and engineers as a saver of time, labor and replacements for breakage.

It is a chemical fusion of rust-eating oils, non-acid in nature, that penetrates the tightest of joints, loosens the rusted nut and removes every trace of rust from metal. A trial will repay the effort. Write for further information.

Put up in pint, quart, one-half gallon and gallon cans.



STEAM SPECIALTIES

. . .

MECHANICAL GOODS

ATLAS VALVE COMPANY

Manufacturers of Pressure and Temperature Control Devices for Every Service

261 South Street, NEWARK, N. J.

AGENTS IN PRINCIPAL CITIES

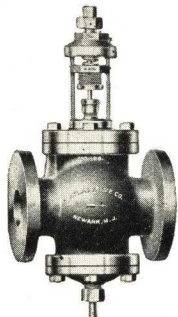


Fig. 104

Type A for Steam

Sizes from $\frac{1}{2}$ to 10 in.

Both the type A and type B reducing valves are pilot operated, and will maintain a uniform reduced pressure, with a widely fluctuating initial pressure. Made for pressures from 25 to 600 lbs. saturated or superheated steam.

Reducing Valves



Fig. 204

Type B for Steam

Sizes from $\frac{1}{2}$ to 10 in.

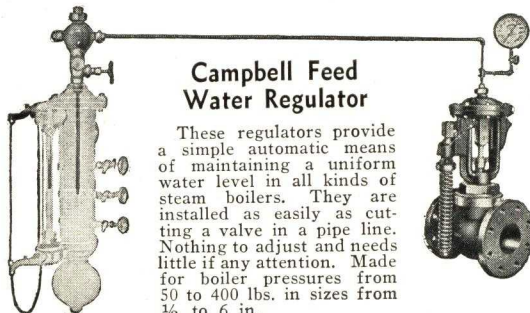
Type E water reducing and altitude valves are diaphragm operated, with balanced single seats and renewable composition discs. They shut-off tight and will keep the reduced pressure from climbing. Made for initial pressures from 1 to 250 lbs.



Fig. 304

Type E for Water or Air

Sizes from $\frac{1}{2}$ to 10 in.



Campbell Feed Water Regulator

These regulators provide a simple automatic means of maintaining a uniform water level in all kinds of steam boilers. They are installed as easily as cutting a valve in a pipe line. Nothing to adjust and needs little if any attention. Made for boiler pressures from 50 to 400 lbs. in sizes from $\frac{1}{2}$ to 6 in.

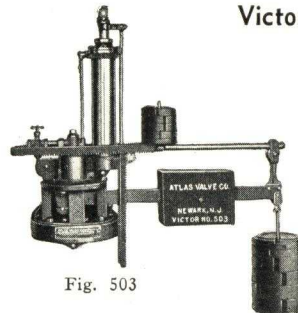


Fig. 503

Victor Damper Regulator

A very sensitive regulator for maintaining uniform pressures. Ideal for boiler damper control, stoker or fan engine throttle control, electric speed regulators and lever operated steam reducing valves. Made in 3 sizes for controlling pressures from atmosphere to 450 lbs.



Fig. I-201

Ideal Style A

Sizes from $\frac{1}{2}$ to 4 in.

The Ideal governor is operated by a piston in a bath of oil. Its simplicity has given it great success for many years in the marine field.

The Atlas type A governor is pilot operated and very sensitive in its action.

Both of these governors are used on all kinds of steam driven pumps to maintain a constant delivery pressure. Made for working pressure up to 450 lbs. and delivery pressures from 1 to 1000 lbs.

Pump Governors



Fig. 202

Atlas Type A

Sizes from $\frac{1}{2}$ to 4 in.

The Atlas type BD-HTS excess pressure pump governor is used to control the pressure delivered by direct acting or turbine driven boiler feed pumps. The Pilotrol, a device used to adjust these governors, has no adjusting springs; they will cause the governor to maintain the feed water at any desired pressure above the boiler pressure from no load to full load without hunting or surging. They are made for working pressures from 50 to 600 lbs.



Fig. 402

Atlas Type BD-HTS

Sizes from $\frac{1}{2}$ to 4 in.

Atlas Lever Operated Control Valves



Fig. 230

Sizes from $\frac{1}{2}$ to 6 in.

The maximum seat opening of these valves can be proportioned by the adjustable fulcrum on the lever, so that any Standard Control Device will give progressive increments of seat opening throughout its entire travel.

Victor Pressure Regulator

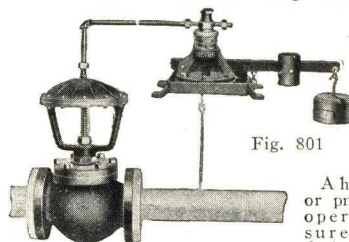


Fig. 801

A hydraulically or pneumatically operated pressure controller designed to maintain delivery pressures within a fraction of a pound, regardless of varying initial pressures or fluctuating loads. Suitable for controlling air, steam or gas pressure and particularly adapted for processing or other exacting service. Sizes ranging from $\frac{1}{2}$ to 6 in., inclusive—for high and low pressure service.

Victor Temperature Regulator

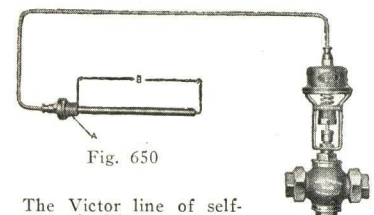


Fig. 650

The Victor line of self-contained Thermostats is used for accurately maintaining temperature of liquids in open and closed tanks, fuel oil heaters, condensers, gas coolers, retorts, etc. Also available for desuperheaters and numerous other applications. Sizes ranging from $\frac{1}{2}$ to 8 in., inclusive.

THE CHAPLIN-FULTON MANUFACTURING CO.

Manufacturers of Steam Specialties

28-40 Penn Avenue, PITTSBURGH, PA.

Products

VIGILANT FEED WATER REGULATOR; FULTON WATER REDUCING REGULATOR; BINGHAM GAGE COCK; FULTON TANK PUMP GOVERNOR; FULTON BOILER-FEED PUMP GOVERNOR; FULTON STEAM REDUCING VALVE; FULTON PATENT EJECTOR.

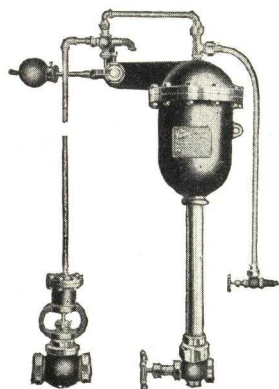
Also manufacturers of Fulton High Pressure or Reducing Regulators, Fulton Low Pressure Regulators, Fulton House Service Regulators, Fulton Duplex Sensitive Gas Governors, Fulton Gas-Fuel Boiler Governors, for steam boilers, using natural or artificial gas for fuel; Fulton Gas Relief Valves, for natural gas gasoline plants; Fulton Back, or Check Pressure Regulators, for natural or artificial gas.

Vigilant Feed Water Regulator

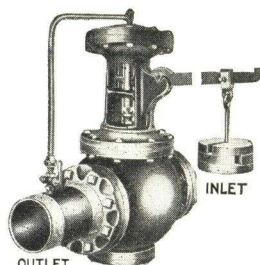
The Vigilant operates on the principle of displacement with no complicated system of levers, floats or diaphragms.

Will automatically supply to steam boiler exact amount of water that is being converted into steam, thereby maintaining constant water level.

Adaptable to any size or style of boiler, independent or in batteries.



Vigilant Feed Water Regulator



Fulton Water Reducing Regulator

Fulton Water Reducing Regulator

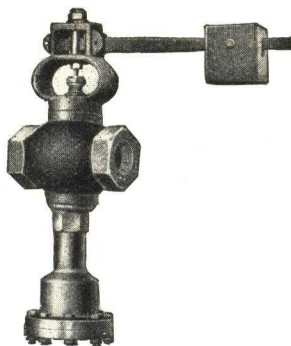
Its duty is to reduce a varying inlet water pressure to a constant and predetermined outlet pressure.

Can be furnished with any trim but our standard construction is iron body, bronze trim.

Sizes, 2 inches and up, either hard or soft seats.

Fulton Boiler-Feed Pump Governor

Automatic regulation of pump in accordance with changing boiler requirements is secured by Fulton governor. Fix excess pressure in feed line at 10 lb., and at 10 lb. the difference will remain, regardless of how boiler pressure fluctuates. Since boiler pressure is carried on one side of piston and pump pressure on the other, only a small difference in pressure between them has to be balanced by governor weight and lever, a marked contrast to the immense springs, etc., often employed.

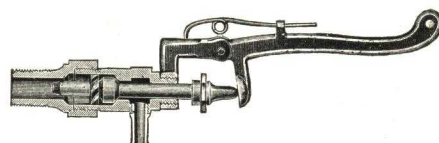


Fulton Boiler-Feed Pump Governor, Piston Type
Also made with diaphragm

Bingham Gage Cock

So constructed that, when testing for water, the valve whirls around with sufficient velocity that it grinds the seat clean and true by its own rotation.

Furnished with long shank for screwing into boiler heads or short shank for water columns.



Bingham Patent Self-grinding, Rotating Gage Cock

Fulton Tank Pump Governor

Fulton tank governor, placed in steam line to pump, maintains a water level at any desired height with but little variation in tanks, standpipes, reservoirs, water towers, etc., or maintains a pressure in water mains at any desired head. May be used in same manner for pumping oil, acid, or any liquid it is desired to maintain at uniform head.

When forcing liquids through heaters, filters, clarifiers or other obstructions, connection to diaphragm must be made in line or tank in which uniform pressure is to be maintained.

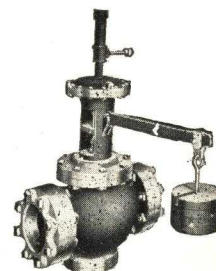


Fulton Tank Pump Governor

Fulton Steam Reducing Valve

Valves, 3 inches and larger, have flanged ends with companion flanges bolted on; are also provided with a trap so that live steam does not come in contact with diaphragm.

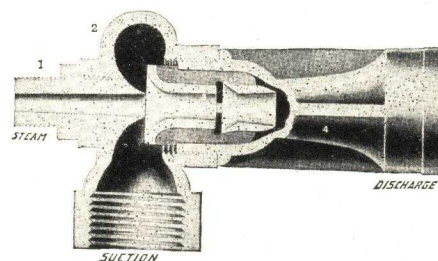
Lever is balanced on a knife edged fulcrum and supports valve stem by means of a toggle connection which reduces friction and insures quick response to slightest change of load.



Fulton Steam Reducing Valve

Fulton Patent Ejector

Two types. Triple acting jet pump requires one-half the steam other jet pumps require. Will lift 15 ft. and force 30 ft. without loss of efficiency. Working pressure, 80 lb. Single acting jet pump will lift water 10 ft. and force it 75 ft. with working pressure of 80 lb.



Fulton Patent Triple Acting Ejector
Also made in single acting type

DAVIS REGULATOR COMPANY

2550 South Washtenaw Avenue, CHICAGO, ILL.

NEW YORK OFFICE, 250 Park Avenue

SALES REPRESENTATIVES IN PRINCIPAL CITIES

AUTOMATIC PRESSURE AND FLOW CONTROL EQUIPMENT FOR PIPE LINES



Fig. 15. Pressure Regulator

For reducing high pressures to low service pressure as in heating. Has interchangeable diaphragm head, deep water seal and no packing box. Globe and expanded outlet patterns

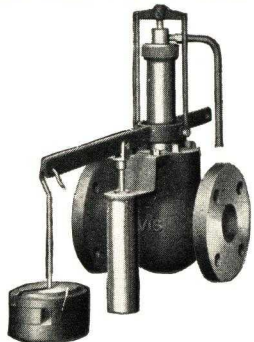


Fig. 403. Pressure Regulator—Piston Type

Automatically makes any pressure reduction. Has visible action and may be hand tested



Fig. 418. Balanced Valve

Controls the flow in pipe lines—unaffected by internal pressure. Operated by float thermostat or other mechanical means

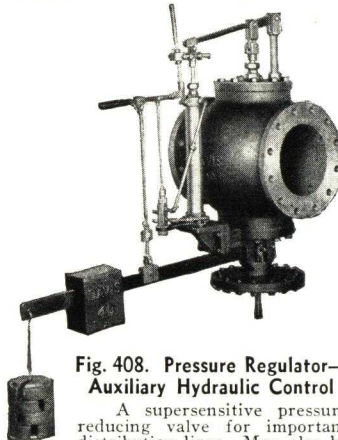


Fig. 408. Pressure Regulator—Auxiliary Hydraulic Control

A supersensitive pressure reducing valve for important distribution lines. May also be constructed to function as a relief valve

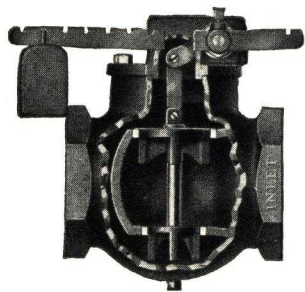


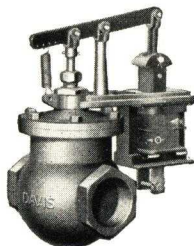
Fig. 425. Back Pressure Valve

A noiseless, double ported, semibalanced valve for maintaining pressure of 20 lb. or less. Brass seat bushing rings and iron disc prevent sticking. A patented construction. Globe pattern may be used horizontally or vertically. Angle pattern made to order



No. 21. Brass Body Water Pressure Reducing Valve

A spring loaded diaphragm valve with single seat and renewable composition disc. Port area is full pipe size. Cushioned action. Tight when closed. Pressure reduction maintained regardless of flow. Used extensively for maintaining the right pressure on plumbing fixtures and wherever a reduced water pressure is required. Sizes $\frac{1}{2}$ to 2-in.



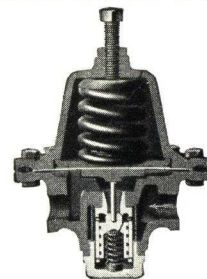
No. 93 Solenoid Valve

A single seated, tight closing electrically operated flow control valve. For steam, water, air, gas and other fluids. Made to either open or close when energized. A-c. or d-c. current



No. 102. Stop and Check Valve

Used on boilers in series to automatically prevent a reverse flow of steam into a disabled boiler. Cylindrical form of disc guided by ribs and stationary piston, which are part of the seat ring, makes a rigid construction free from expansion troubles. The action is effectively cushioned. Globe, angle and elbow patterns for all pressures



No. 13. Pressure Reducing Valve

A compact self-contained valve suitable for steam, air and gas pressure reduction. Has single seat, spring loading and built-in strainer. Closes tight. Maintains reduction regardless of circulation. The phosphor bronze diaphragm has a limited movement which makes necessary a restricted port area. Recommended for conditions requiring less than full pipe capacity. Sizes $\frac{3}{8}$ to 2-in.



Fig. 434. Exhaust Relief Valve

Protects condenser from pressure accumulation. Has full pipe area; brass seat; water seal. Hand and hydraulic lift types—horizontal, vertical and angle patterns

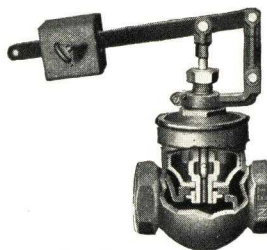


Fig. 422. Fluid Control Valve

Works like a balanced valve. Has single seat and composition disc. Closes tight. Will not stick

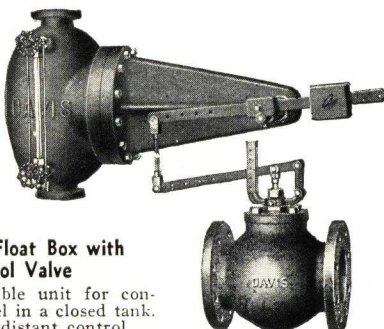


Fig. 461. Float Box with Control Valve

An accessible unit for controlling the level in a closed tank. Made also for distant control



Fig. 419. Float Valve—Globe and Angle Patterns

Used on makeup line to open tank—maintains constant level. Has no internal packing—closes tight. Will not stick

Catalogue

This and other equipment in the Davis line is detailed in General Catalog which will be sent on request.

ESTABLISHED 1870

JULIAN D'ESTE COMPANY

INCORPORATED 1892

Sole Manufacturers of Curtis Engineering Specialties

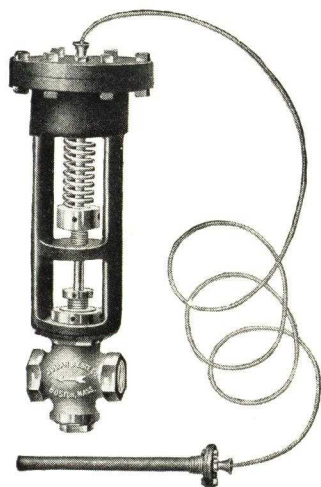
6 Spice Street (Charlestown District)
BOSTON, MASS.CABLE ADDRESS
"Hull, Boston"**Products**

TEMPERATURE REGULATOR; PRESSURE REGULATOR; BULB THERMOSTAT; HYDRAULIC DAMPER REGULATOR; TANK and FLOAT VALVES; STEAM REDUCING VALVE; BUCKET TRAP.

Also complete line of Reducing Valves for steam, air, oil, water and gas; Steam Traps; Combustion Controls and Float Valves.

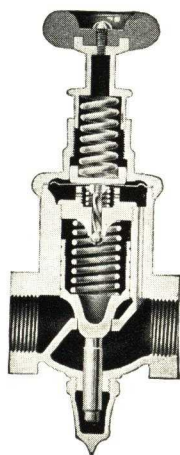


TRADE-MARK

**d'Este Temperature Regulator**

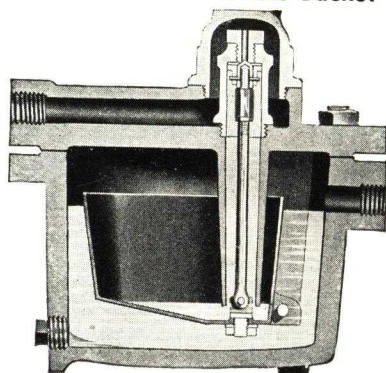
Quick response to temperature changes. Minimum cost of installation and upkeep. Self-contained—no exterior operating medium required.

Sizes: 1/2-6 in.

**Curtis Pressure Regulator—Type D**

A compact, self-contained valve, piston actuated, pilot controlled, for steam or air service. Ideal for high and intermediate pressures.

Sizes: 1/2-4 in.

**d'Este Bucket Trap**

Positive in action. Intermittent flow design. Accessible for inspection. Only two wearing parts—valve and seat—made of stainless steel.

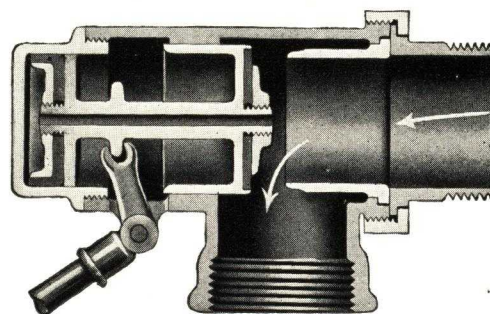
Ruggedly designed for modern power plant practice.

Sizes: 1/2-2 in. inclusive.

Tank and Float Valves

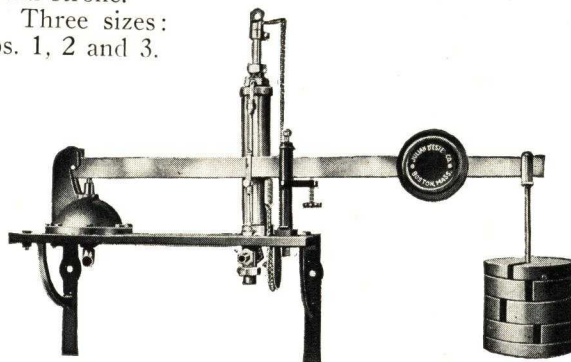
All cast bronze throughout. Renewable balanced valve and single seat with full size waterway. Absolutely tight under pressure. Not affected by pump pulsations.

Sold on an absolute guaranteed basis.
Sizes: 3/4-4 in.

**d'Este Hydraulic Damper Regulator**

Sensitive, heavy duty damper control. Double actuated valve with compensating mechanism operating partial stroke.

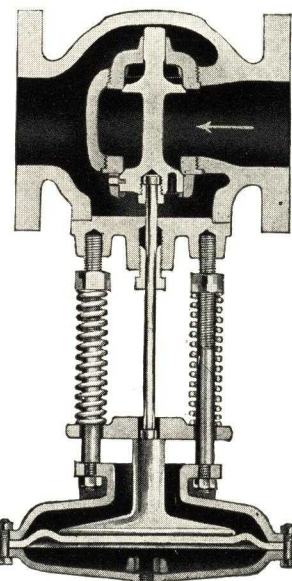
Three sizes:
Nos. 1, 2 and 3.

**Type DS Steam Reducing Valve**

Diaphragm operated. Spring controlled. Increased sensitivity with guided springs. Supported main valve without feather guides.

For medium and low pressure service conditions.

Sizes: 1/2-4 in. inclusive.



FISHER GOVERNOR COMPANY

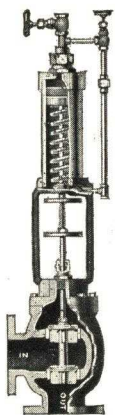
Dependable Automatic Specialties

1202 Fisher Building, MARSHALLTOWN, IOWA

Products

PUMP GOVERNORS; LIQUID LEVEL CONTROLLERS; STRAINERS; STEAM TRAPS; PILOT OPERATED CONTROLLERS; GAS REGULATORS; AUTOMATIC FLOAT VALVES; PRESSURE REDUCING VALVES.

Back Pressure, Chronometer, Balanced Lever and Float Valves; Suction Strainers; Liquefied Petroleum Gas Regulators; Propane Regulators; Vacuum Controllers; Fluid Mixers; Steam and Oil Separators; Exhaust Heads; Governors for Marine Service; House Service Gas Regulators; Relief Valves; Vapor Pressure Controllers for Storage Tanks; Vacuum Traps; Air Traps; Hydraulically Operated Valves; complete line Oil Field Specialties and Gas Regulators; Refrigeration Expansion Valves and Controls.



Type No. 1
Pump
Governor

Fisher Pump Governors

Type No. 1—A piston type governor for automatically starting and stopping pumps working under pressure and for maintaining a uniform pressure on the discharge side. Used on steam turbines, underwriters' fire pumps, and pumps for waterworks, hydraulic elevators, boiler feed, air compressors, etc. Simple construction; easy and positive operation; carefully tested under actual working conditions. Furnished in globe or angle patterns, in sizes $\frac{1}{2}$ to $3\frac{1}{2}$ in. with screwed ends; 1 to 6 in. with standard or extra heavy flanged ends. Range, 5 to 500-lb. discharge pressure. Details given in Bulletin No. 1-A.

Other Types—Other Pump Governors are made for discharge pressures up to 10,000 lb. and for excess pressure boiler feed service. Governors for every pumping service including vacuum and marine service. Bulletin No. 1-A.

Fisher Liquid Level Controllers

Fisher is an outstanding level controller specialist, manufacturing the most complete line of direct, remote, and internal types. Type No. 232C (Ball Bearing) illustrated at right is rotary stem, ball bearing stuffing box, completely friction-free. Made in all sizes and for all



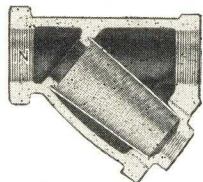
Type
No. 232C
Liquid
Level
Controller

kinds of liquids. Bulletin No. 36-A.

Fisher Strainers

Type No. 260 Fre-Flow Strainer is only one of the complete line of Fisher Strainers. This type is particularly designed for self-cleaning of screen by blow-off through bottom plug. Also a complete line of suction and drip pocket strainers.

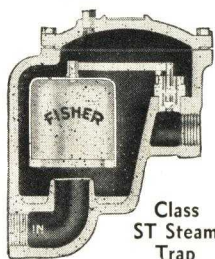
Write for new Catalogue.



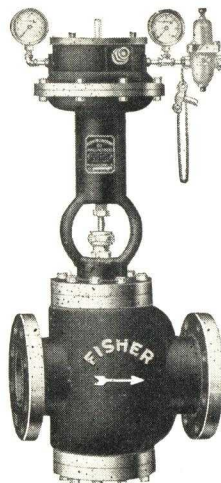
Type No. 260
Strainer

Fisher Inverted Bucket Steam Traps

Class ST—Made in sizes $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, and $1\frac{1}{4}$ in., the last size being for extra large capacities. Sturdy but compact semi-steel body with vital parts of stainless steel. Leverage is extra powerful, giving quick opening and closing, self-cleaning, non-air binding. All parts easily renewable without breaking pipe line. Inner valve post has adjustment for ease of setting when replacing parts. Horizontal inlet and outlet connections. Bulletin ST10.



Class
ST Steam
Trap



Series 4200 Wizard Pilot
Control

Fisher manufactures a complete line of gas regulators.

Fisher Auxiliary Controlled Regulators

There are many installations where accurate sensitive control of pressure is demanded, and where direct-operated controls are not suitable.

Fisher has a complete line of pilot-operated units.

The Series 4200 Wizard Pilot is for use where air or gas is available for operating medium; and the Series 777 Pilot for use where fluid in main line must be used as operating medium.

Series 4200 is shown at the left.

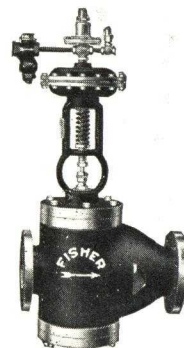
The Series 2200 Master Control for all pressure conditions is for use where water or air is operating medium is available.

Write for new Bulletin 5A.

Fisher Gas Regulators

Type No. 520—A highly sensitive boiler gas fuel governor, pilot operated and equipped with a streamline body to give maximum flow on minimum pressure drop, insuring economical boiler operation. Made in all sizes 1 to 10 in.

Write for new Catalogue.



Type No. 520
Gas Regulator

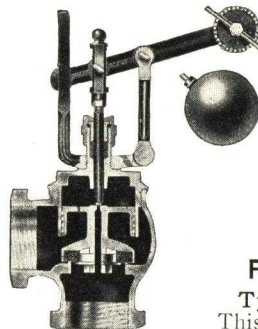
Fisher Float Valves

Fisher offers the most advanced line of automatic float valves.

Type No. 171 shown is self-contained pilot operated, single seat composition valve disc. Positive shut-off—no water hammer. Particularly suited for operation in all types of water tanks for maintaining a constant level.

There are also Fisher Float Valves of remote control type and other designs.

Send for Catalogue.



Type No. 171
Float Valve

Fisher Pressure Reducing Valves

Type No. 10A—This type has been greatly improved, as have all Fisher lever and weight operated valves. Now furnished with swing-link yoke, permitting installation with diaphragm either above or below the pipe line.

Suitable for low pressure or vacuum steam heating systems or any steam or gas installations where reduced pressure is of low or intermediate valves.

Made in all sizes and with expanded outlet.

Write for Bulletin No. 5-A.



Type No. 10A
Reducing Valve

GOLDEN-ANDERSON VALVE SPECIALTY CO.

1315 Fulton Building, PITTSBURGH, PA.

Golden-Anderson Patented Cushioned Automatic Controlling Altitude Valves—Automatic Water Control



(1) For automatically maintaining uniform level of water in tanks, reservoirs and standpipes.

(2) Prevent interruption to water system and loss of water by overflow from tanks, reservoirs or standpipes. Prevent interruption to fire, sprinkler or other water distribution services.

(3) Do away with the annoyances of freezing.

(4) No floats, valves or fixtures used inside or outside of tanks.

(5) Valves cushioned at all times by air and water—no waterhammer or bursting mains.

(6) Three ways of closing—automatically by water; by electricity; by hand.

(7) May also be arranged to automatically close when a break occurs in the mains.

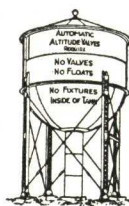
(8) May be so connected as to "work both ways" on a single pipe line without removal of valve.

(9) Made with stop starter attachment for centrifugal pumps.

(10) Sizes from 2 to 24 ins.



TRADE MARK



Golden-Anderson Patented Cushioned Combined Throttle and Automatic Engine Stop Valves

(1) Operate 3 ways—automatically, by hand, and by electric switch.

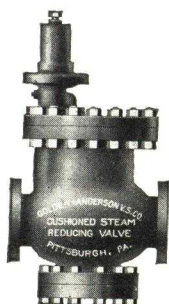
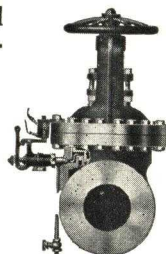
(2) Prevent flywheel explosions.

(3) Double Corliss cushioned—no pounding or sticking.

(4) Contain no tight-fitting parts.

(5) Furnished in globe and angle patterns for high or low pressures.

(6) Always ready for service.



Golden-Anderson Patented Automatic Cushioned Steam Pressure Reducing Valves

(1) Maintain a constant reduced pressure.

(2) Thoroughly cushioned.

(3) No hammering, chattering or sticking.

(4) Only one adjustment from the outside.

(5) Double extra heavy throughout—practically indestructible. Sizes from 1/2 to 12 ins.



Golden-Anderson Patented Automatic Double Cushion Check Valve

(1) Especially adapted for hydraulic elevator service and on discharge side of pumps.

(2) Sizes up to 24 in., angle or globe.

Golden-Anderson Patented Automatic Cushioned Water Float Valves

(1) Automatically maintain uniform water levels in tanks, standpipes, etc.

(2) Instantly adjusted to operate quickly or slowly.

(3) Floats swivel to any angle. Most satisfactory float valves known.

(4) No metal-to-metal seats. No waterhammer or shock.

(5) Cushioned by water and air.

(6) Sizes 1/2 to 24 in. angle or globe.



Golden-Anderson Patented Automatic Double-cushioned Triple-acting and Non-return Valves Life and Property Insurance Valves

(1) Prevent expensive shutdowns due to reversal of steam.

(2) Instantly close and isolate a boiler when a tube ruptures or other internal break occurs.

(3) No shutdowns when a boiler tube bursts.

(4) Simultaneously shut off steam flow from all boilers the instant that a steam pipe bursts.

(5) Automatically cut a boiler into the line.

(6) Prevent back flow of steam into a cold boiler.

(7) Positively foolproof. No springs. No adjustment to be made.

(8) Can be tested in service.

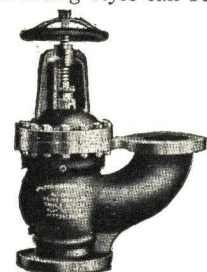
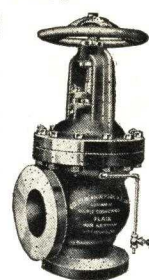
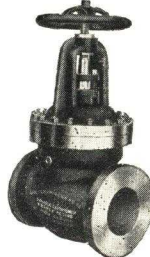
(9) Double Corliss dashpot cushions in opening and closing.

(10) By disconnecting pilot valve triple acting style can be made into plain non-return. Examination of its design will show it, we feel, to be the best possible non-return valve.

(11) Double extra heavy cast steel valves for high pressures and superheated steam.

(12) Every valve sold with a positive guarantee.

(13) 4601 of these valves are being used by the large iron and steel corporations. Thousands purchased on repeat orders. Sizes 2 to 12 ins.



Golden-Anderson Patented Cushioned Electric Water Service Valves

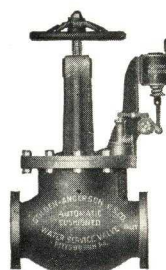
(1) Give instant control of water distribution from pumping station in case of fire.

(2) Open or close by electricity from distant points and from alternating or direct current circuits. Also close by hand.

(3) No waste of electricity. Current is on only a few seconds.

(4) Cushioned in opening and closing.

(5) No waterhammer, shock, sticking, surging or chattering. Sizes 3 to 24 ins.



Golden-Anderson Patented Automatic Cushioned Controlling Float Valves

(1) Automatically maintain uniform level in heaters, tanks, etc.

(2) Air and water cushioned.

(3) No metal-to-metal seats.

(4) No waste of water.

(5) No waterhammer or shock.

(6) Globe and angle patterns.

(7) Sizes 1/2 to 24 ins.



Golden-Anderson Patented Automatic Cushioned Water Pressure Regulating Valves

(1) Maintain a constant reduced pressure regardless of fluctuations on high pressure side.

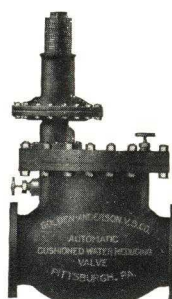
(2) Perfectly cushioned by water and air. No metal-to-metal seats.

(3) The best valve made for maintaining a constant low pressure when consumption is continuous or intermittent.

(4) Operates quickly or slowly as required. No attention necessary.

(5) Positively no hammering or sticking.

(6) Sizes 1/2 to 24 ins.



O. C. KECKLEY COMPANY

Precision Pressure Regulating Valves with Stainless Steel Renewable Valves and Seats and Unit Pilot Valve

566 Washington Boulevard, CHICAGO, ILL.

KECKLEY PRECISION PRESSURE REGULATOR TYPE AA

For All Pressures Up to 300 Lbs. and Temperatures Up to 550° F.

Suitable for Maintaining Pressure to One Pound

Description

The KECKLEY PRECISION PRESSURE REGULATOR has for its greatest advantages simplicity in design and the renewability of all wearing parts.

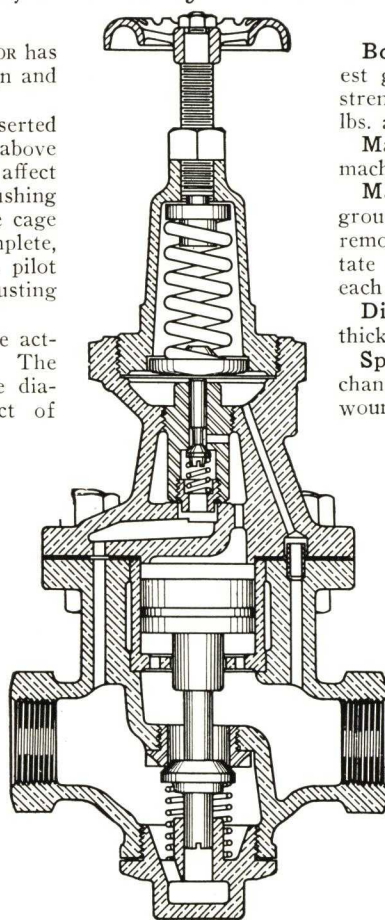
The main valve seat of stainless steel is inserted from the bottom of the body. The piston above the valve, where dirt and sediment will not affect its operation, rides in a bronze cylinder bushing which can be easily replaced. The pilot valve cage is screwed into the top casing as a unit complete, with valve and spring. Directly above the pilot valve is the diaphragm held down by the adjusting spring case.

The main valve is opened by high pressure acting on the large piston directly above it. The pilot valve, working in conjunction with the diaphragm, actuated by any unbalanced effect of the adjusting spring and low pressure beneath it, controls accurately the necessary pressure to the piston. Thus the pilot valve, extremely sensitive to the secondary pressure, opens and closes the main valve in proportionate degrees to maintain the desired constant low pressure at all times.

Sudden fluctuations in initial pressure are prevented from reaching the secondary side of the expansion chamber effect of the piston cylinder.

Constant pressure on the secondary side will be maintained from zero or dead end to maximum flow capacity of the valve, regardless of wide variations in primary or high pressure side of the line.

Built of the finest materials, with precision workmanship, thoroughly tested under all operating conditions these KECKLEY REGULATORS, with all parts subject to wear readily removable and renewable, offer maximum efficiency, not only as to close regulation but also dependability with minimum maintenance through years of service.



Cross Section of Type AA Regulating Valve Showing Relation of Component Parts

Note accessibility to every piece of valve construction

Specifications—Construction

Body Castings—All body parts are of the highest grade Government bronze, insuring maximum strength. Guaranteed for all pressures up to 300 lbs. and temperatures up to 550° F.

Main Valve—Made of stainless steel, accurately machined, ground and polished.

Main Valve Seat—Stainless steel with seat ground and polished. Screwed into body. Readily removable and renewable. Special wrench to facilitate removal of main valve seat is furnished with each Regulator.

Diaphragm—Phosphor bronze, rolled to accurate thickness. Selected stock.

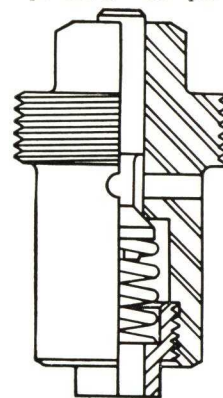
Springs—Vanadium steel, impervious to tension changes due to temperature variations. Accurately wound. Ends ground square. Heavily cadmium plated.

Piston—Government bronze, accurately machined and readily removable. Carries piston ring of high resiliency and sealing characteristics.

Piston Cylinder—Renewable cylinder bushing with integral head of Government bronze. Can be removed and renewed.

Gaskets—Copper asbestos gaskets, both under main valve cap and between body and body cap. Maximum resistance to leakage.

Pilot Valve—The Pilot Valve, spring and cage is, of course, the "Heart of the Regulating Valve." For this reason we have so designed this portion of the KECKLEY REGULATING VALVE to be removable as a unit. The cut shows this unit construction with cage and valve assembled. Valve and cage are stainless steel accurately ground and polished. Compare this unit construction in the KECKLEY VALVE with other types where the various component parts of pilot valve must be removed individually.



Unit Pilot Valve of Type AA Regulator

DIMENSIONS OF KECKLEY TYPE AA PRECISION REGULATOR (IN INCHES)

Size	Face to face		Center to bottom	Center to top	Total height	Diam. of flanges	Thick. of flanges	Bolt circle	No. of bolts	Size of bolts	Diam. of bolt hole	Net Weight		Price	
	Screw'd	Flanged										Scr'w'd	Fl'ng'd	Screw'd	Flanged
1/2	5 3/4	6 3/4	2 5/8	10 3/4	13 3/8	4 7/8	9/16	3 1/2	4	5/8	3/4	18	25	\$37.50	\$45.00
3/4	5 3/4	6 3/4	2 5/8	10 3/4	13 3/8	4 7/8	9/16	3 1/2	4	5/8	3/4	18	25	37.50	45.00
1	5 3/4	6 3/4	2 5/8	10 3/4	13 3/8	4 7/8	9/16	3 1/2	4	5/8	3/4	18	25	37.50	45.00
1 1/4	6	7	2 13/16	11	13 13/16	5 1/4	9/16	3 7/8	4	5/8	3/4	21	28	47.50	55.00
1 1/2	6 1/4	7 1/2	3 1/8	11 1/4	14 3/8	6 1/8	9/16	4 1/2	4	5/8	3/4	25	35	60.00	68.00
2	7 1/2	8 3/4	3 1/2	11 1/2	15 1/2	6 1/2	5/8	5	8	5/8	3/4	38	49	80.00	90.00
2 1/2		9 3/4	4 1/2	12 1/2	17	7 1/2	11/16	5 7/8	8	5/8	3/4		65		115.00
3		11	5 3/8	12 7/8	18 1/4	8 1/4	3/4	6 3/8	8	5/8	3/4		98		145.00

Data on larger sizes furnished on request.

Furnished in steel for high temperatures and pressures.

OTHER KECKLEY PRODUCTS

Accumulators

Hydraulic

Boxes

Outlet, Electric Conduit
Outlet, Electric Switch
and Receptacle Switch

Cocks

Gage or Try

Controllers

Liquid Level
Pressure
Temperature

Discs

Valve

Floodlights

Gages

Protectors
Water
Water, Lights for

Governors

Constant Pressure Pump
Steam Pump
Vacuum Pump

Hoists

Air
Ladders
Steel Rung

Lubricators

Air Compressors

Presses

Hydraulic

Pumps

Hydraulic

Strainers

Pipe

Swimming Pool
Underwater Lights

Valves

Blow-off
Float or Tank
Foot, Oil Tank
Hydraulic Operating
Hydraulic Relief
Reducing or Regulating
Pressure

ESTABLISHED 1879

KIELEY & MUELLER, INC.

Steam, Water and Air Specialties for Power, Heating and Plumbing Installations

34 West 13th Street, NEW YORK, N. Y.

AGENTS IN ALL THE PRINCIPAL CITIES

Products

VALVES: Altitude, Stop and Check, Pressure Regulating, Float, Pilot Reducing, Back Pressure, Tank Control.

AUTOMATIC WATER FEEDERS and CONTROLLERS, PUMP GOVERNORS, STEAM TRAPS.

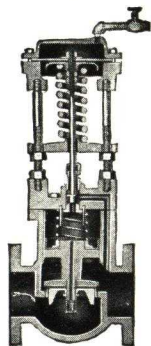
Also Damper Regulators, Hot Water Temperature Controllers, Oil Separators, Steam Separators, Return Traps, Water Columns, etc.



Engineering Co-operation

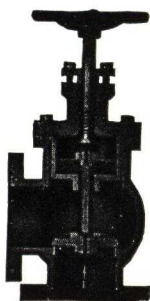
Because of their simplicity and lasting qualities, low cost of operation and accuracy in regulation, Kieley Specialties merit the serious consideration of all contemplating the construction, renovation, etc., of plants wherein high efficiency is required.

Our Engineering Department will be glad to co-operate in the selection of the proper device for individual service requirements.



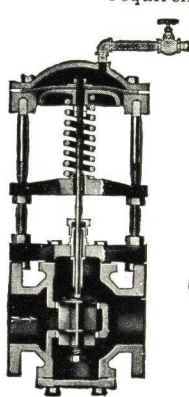
Altitude Valve

For controlling water level in elevated tanks and towers. Sensitive and positive in operation. The pilot is diaphragm operated and controlled by a small feeler pipe connected on the discharge side. Thoroughly cushioned when opening and closing to insure against water-hammer and shock. Constructed of cast iron with bronze trim.



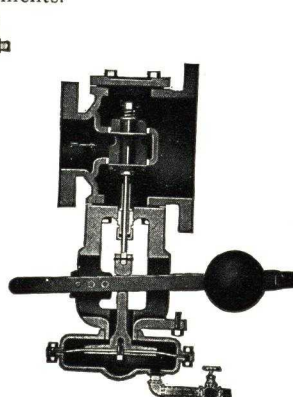
Stop and Check Valve

Double and triple duty types. Stuffing box can be packed under pressure and valves have no outside working parts. Positive in action and absolutely reliable. Cast iron, cast steel and monel metal.



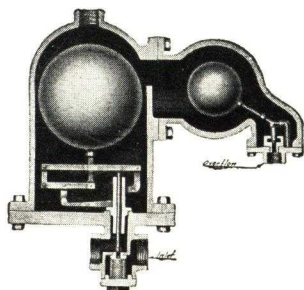
Pressure Regulating Valve

Spring and lever weighted valves for pressures up to 200 lb. and under to 1 lb. Suitable for water, air and gas and controlled by a small feeler pipe connected from diaphragm to low pressure side. Bronze, cast steel or cast iron.



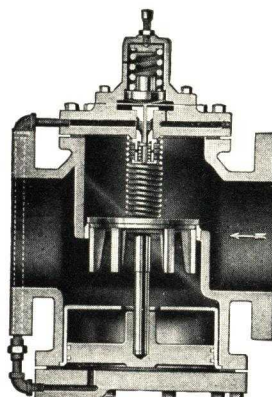
Float Valve

Automatic piston actuated. For hot or cold water. Designed to close and remain tight regardless of pressure on inlet side. Piston operates in non-corrodible brass sleeve and cannot stick. Sizes from 2 to 12 in. Cast iron with bronze seats.



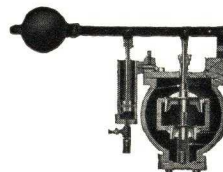
Kieley 824-A Duplex Water Feeder

For maintaining water level in low pressure boilers, receiving tanks, etc. This Duplex Feeder will admit make-up water to boilers and discharge excess water which might gravitate back to the boiler when the fire is banked; or if automatic combustion is used, will maintain an even level during the on and off periods of automatic firing. It is fitted with an integral strainer and the valve and valve seat are accessible for removal by unscrewing a plug located on the bottom of the valve body.



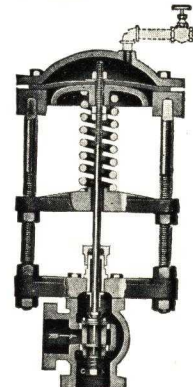
Pilot Reducing Valve

For regulation and reduction of high pressure steam to intermediate pressures. Bronze, cast steel or cast iron. Pilot is controlled by small feeler pipe which can be connected at point where the desired pressure is to be maintained.



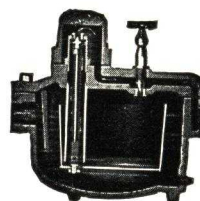
Back Pressure Valve

Fitted with bronze removable double or single seats according to requirements. Outside air dashpot eliminates chattering. Back pressure is maintained as desired within the operating range by simply moving weight in or out on lever. Valves close absolutely tight. Horizontal or vertical and can be furnished with spring for pressure regulation if desired.



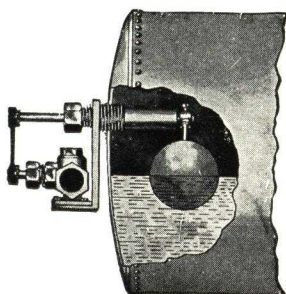
Pump Governor

For regulating pump discharge pressures from house pumps, boiler feed pumps or fire pumps. The governor is very sensitive and will absolutely maintain the pressure on the discharge of the pump for which it is set. Furnished with various type casings for pumping brine, chemicals or other liquids. Valve is furnished with bronze body or cast iron body with bronze or monel metal seat and disc.



Steam Trap

Cast iron or steel with nickel valves. The valve is accessible by removal of small cap. All working parts may be removed without disturbing connections. Valves close absolutely tight and all parts are interchangeable.



Tank Control Valve

Can be used for regulating a pump and also for operating an electric switch. Provided stuffing box and floats for high pressure.

Complete Catalogue of Kieley Specialties

The devices illustrated are only a few of the Kieley line of specialties which are suitable for the most exacting requirements when used in connection with power, heating and plumbing installations.

A complete catalogue will be sent on request.

MASON-NEILAN REGULATOR CO.

(CONSOLIDATION OF MASON REGULATOR CO. OF BOSTON AND NEILAN CO. LTD. OF LOS ANGELES)

1190 Adams Street, BOSTON, MASS.

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CANADIAN OFFICE: 686 Notre Dame Street, West, MONTREAL

For Mason-Neilan Instruments: Pressure, Temperature, Combustion and Flow Controllers, see Manufacturers' Index

Products

REDUCING REGULATORS.
PUMP PRESSURE REGULATORS.
HEATING SYSTEM REDUCING VALVES.
STRAINERS.

Also Pump Speed Governors; Excess Pressure Pump Governors; Blower and Fan Engine Regulators; District Steam Reducing Valves; Vacuum Regulators; Balanced and V-port Valves.

Standard Reducing Valves

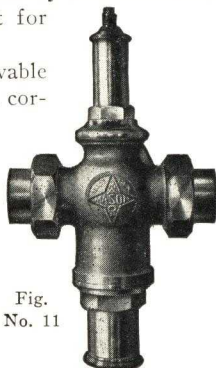
Automatically reduce and maintain constant pressure of steam for process, power or heating. They are widely used to control processing equipment of all kinds. Built for years of accurate, dependable service.

Valves and valve seat rings are removable and renewable. They are machined from corrosion-resistant stainless steel.

Sizes $\frac{1}{2}$ to 2 in.; bronze body, union connections. Sizes $2\frac{1}{2}$ to 6 in.; iron bodies, extra heavy flange connection.

Initial pressures up to 250 lbs. Reduced pressures above 5 lbs. Other Mason Reducing Valves with cast alloy steel bodies and stainless steel trim for pressures up to 600 lbs.

A special feature of Mason Auxiliary Operated Reducing Valves is the quickly replaceable diaphragm spring which permits different reduced pressure ranges by simply replacing one spring with another. Thus, in effect, these regulators become several distinct reducing valves in one.

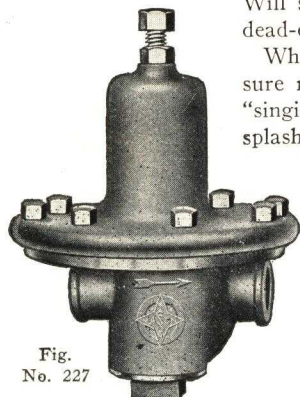


Mason Standard Reducing Valve

Water (and Air) Reducing Valves

Will maintain even reduced pressures of water and air between 10 and 60 lbs. from service pressures up to 200 lbs. Will shut off tight and can be used for dead-end service.

When used as a household water pressure regulator it will stop objectionable "singing" in bathroom fixtures and splashing from faucets without cutting down the flow of water. Also reduces strain on plumbing, and eliminates excess leakage from ball cocks, faucets and other fixtures. All metal parts are bronze except steel spring and cap screws which are specially treated to prevent rusting. Exceptionally strong and durable.



Water and Air Reducing Valve

Initial Pressure Range: Up to 200 lbs.
Reduced Pressure Range: 10 to 60 lbs.
Sizes: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ and 2 in.



Lever Style Reducing Valves

For reducing pressure of saturated steam for all types of heating systems. Normally wide open valve, closes only when reduced pressure reaches point for which valve is set. Especially suited to low pressure systems where initial pressure may fall to or below required reduced pressure.

Sizes $\frac{1}{2}$ to $1\frac{1}{2}$ in., inclusive, are made with bronze bodies and parts with tapped ends. Sizes 2 in. and up have iron bodies, bronze parts,

Fig. No. 236-A



Lever Style Reducing Valve

American Standard Flange connections, faced and drilled.

Special moulded rubber diaphragms are furnished with canvas insertion. For installations requiring very delicate regulation in ounces, a large diaphragm suitable for reduced pressures below 3 lbs. can be furnished.

Sizes: $\frac{1}{2}$ to $1\frac{1}{2}$ in.; 150 lbs.; bronze body and parts, tapped end connections. 2 to 6 in.; 125 lbs.; iron body, bronze parts, and flange connections.

Initial Pressure Ranges: Up to 150 lbs., bronze body sizes. Up to 125 lbs., iron body sizes.

Reduced Pressure Ranges: Vacuum or 0-3 lbs. (11-in. diaphragm); 2-15 or 15-40 lbs. ($7\frac{1}{8}$ -in. diaphragm).

Strainers

For use on steam, air or water lines to prevent sediment, scale, bits of packing or other foreign material from passing into regulators.

Prevent the annoyance incident to taking the regulator apart to clean it, and assure the user continuous service and the avoidance of expensive shutdowns.

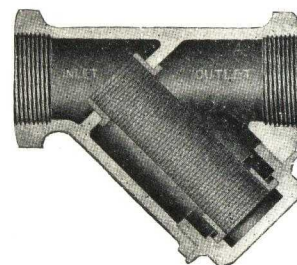
Will not reduce the volume of water passing through them, yet are compact and easily cleaned without removing from the line.

Sizes $\frac{1}{4}$ to $1\frac{1}{2}$ in., inclusive, are made of bronze with tapped ends suitable for pressures up to 200 lbs.

Sizes 2 to 6 in., inclusive, are made in two weights, standard for pressures up to 125 lbs., and extra heavy for pressures up to 250 lbs.

Bulletins

Bulletins on these and all other pieces of Mason Equipment available on request.



Mason Standard Strainer

NORTHERN EQUIPMENT COMPANY

Manufacturers of the Copes System of Boiler Feed Control

MAIN OFFICE AND WORKS

1330 Grove Drive, ERIE, PA.

HAMILTON, ONTARIO

PARIS, FRANCE

VIENNA, AUSTRIA

LONDON, ENGLAND

HEIDELBERG, GERMANY

MILAN, ITALY

REPRESENTATIVES EVERYWHERE

Copes System of Boiler Feed Control

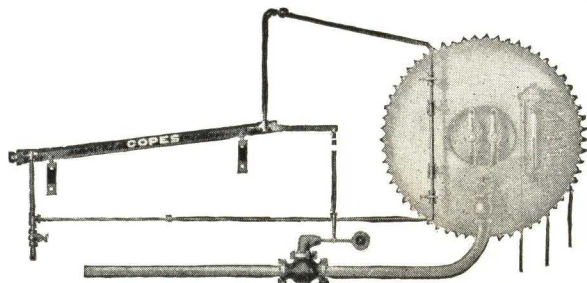
Copes Regulation provides continuous feed on a working boiler with water level stabilized between fixed limits. This means: Higher overload capacity. Smooth rate of feed. Smoother water and steam charts. Higher feed water temperatures. More constant superheat. Storage of heat at low loads. Drier steam. More even load on feed pump. Minimum wear on pumps, feed lines, valves, etc. Less drop in pressure on overloads. Even distribution of load between boilers of a battery. Fuel saving, 3 per cent. Write for Catalog 33-S.



Copes Type BI Feed Water Regulator

Sizes: $\frac{3}{4}$ to 6 in. Pressures: up to 1800 lb. Consists of a thermostat, the actuating element, connected by a rigid strut to a balanced valve controlling flow.

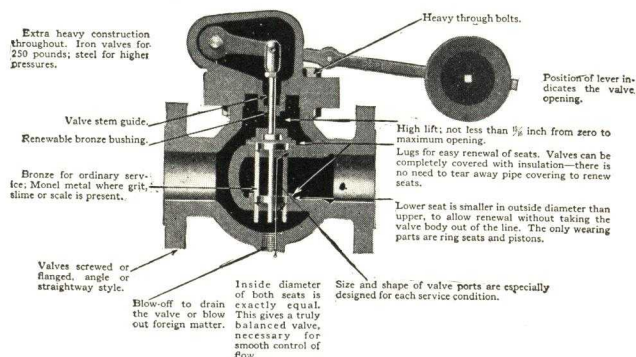
Thermostat—An expansion tube, in tension, is welded to head and heel pieces and protected throughout its length by heavy channel supports. Upper end of tube is connected to the steam space and lower end to water space of boiler. Any movement of boiler water level causes an immediate and corre-



sponding movement in expansion tube. This acts as a thermostatic relay, transmitting each movement of water level into a powerful force for actuating the valve. A tension relief in the strut prevents undue strain.

Control Valve—Fully balanced, rugged and practically frictionless Type BI. Usual sliding stem moving in a stuffing box is replaced by a rotating horizontal lever shaft. Accumulations of dirt on the outside cannot affect the operation or the packing. Friction is reduced to a minimum.

For pressure standards above 250 lb. control valve bonnet is equipped with outboard ball bearings which support outer end of lever shaft, preserve alignment of shaft in the stuffing box, counteract internal end thrust on shaft and reduce friction. Valve ports designed for specific flow conditions.

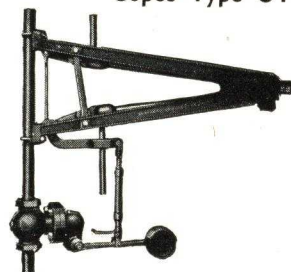


Copes Type OT Feed Water Regulator

Sizes: $\frac{3}{4}$ to 2 in. For a maximum pressure of 250 lb.

For oil field, horizontal return tubular and Scotch marine boilers. Same principle of operation as Type BI.

Compact. Thermostat, only 37 in. long, is self-supporting on a vertical boiler feed line. Rugged. Expansion tube protected by malleable iron frame. Type BI Valve. Write for Folder 113-S.

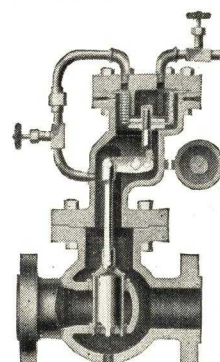


Copes Type SS-2 Differential Valve

Sizes: $\frac{3}{4}$ to 6 in. Pressures: 250 to 600 lb.

Eliminates varying excess pressure in individual boiler feed lines caused by fluctuating boiler loads, changing friction losses or varying pump pressure. This permits the feed water regulator to feed more closely in accordance with load demands. Smoother flows result, with added increase in efficiency.

Simple, rugged, compact. Accurate. Actuated by a 4-ply brass syphon bellows subjected to and influenced by differential water pressure. Can be installed in horizontal or vertical feed line. Write for complete details.



Copes Type SDS-2 Pump Governor

Sizes: $\frac{3}{4}$ to 6 in. Pressures: 250 to 600 lb.

Simple, rugged, dependable. Excess pressure regulated by a carefully selected spring. Actuated by a 4-ply brass syphon bellows. Usual sliding valve stem replaced by rotating horizontal lever shaft as in control valve of Copes Type BI Regulator.

For service on reciprocating or centrifugal pumps, turbine or motor driven. For excess pressure service in boiler feeding. Get Folder 129-S.



Other Copes Products

Balanced Valves—for controlling flows of liquids or steam under pressure.

Condensate Drainage Controls—for intermittent or continuous drainage.

Excess Pressure Controls for Electric Motor Driven Pumps. Feed Water Regulators (types not illustrated on this page):

Copes Balanced Flow Regulator—balances feed water input against steam flow, correcting for water level changes.

Copes Double Control Regulator—feeds according to rate of steam flow, correcting for water level changes.

Type RG Regulator—combines a differential pressure control valve and a type BI Regulator in a single unit.

Liquid Level Controls—for low- or high-pressure service.

Low Water Alarms with Fuel Cut-out Valves.

Motor-operated Valves—for remote control service.

Phosphate Feeders—for proportioning phosphate to feed flow.

Solenoid-operated Valves—for remote control service.

Thrustor-operated Valves—for remote control service.

Vacuum Governors.

Catalog 33-S Sent Free on Request

RUGGLES-KLINGEMANN MFG. CO.

Manufacturers of a Complete Line of Regulating Devices

SALEM, MASS.

Products

Regulators—Boiler Steam Pressure, Overfire Draft, Stoker and Blower Control.

Regulators for reducing steam pressure and for the control of temperature.

Valves—Reducing Pressure, Boiler Stop and Check, Back Pressure, Turbine Bleeder Check, Relief for extraction lines, Motor Operated and Solenoid Operated, Three and Four-way Solenoid, and Solenoid Trip.



Regulators

Fig. 25-B R-K "Step Action" Regulators—Eliminate over correction and hunting action. Variable boiler loads are controlled through step action regulators, as the nearest approach to economies obtainable under base load conditions.

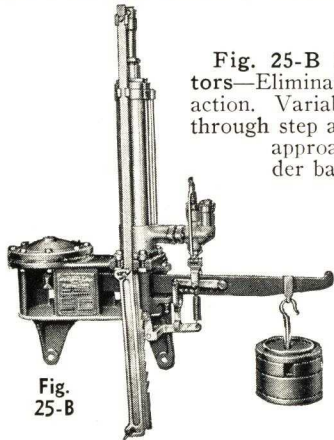


Fig. 25-B

Fig. 33 R-K "Step Action" Temperature Regulators—Provide powerful operating means for the control of large size balanced lever valves for supplying steam

to storage or instantaneous types of hot water heaters.

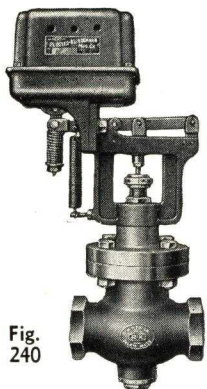


Fig. 240

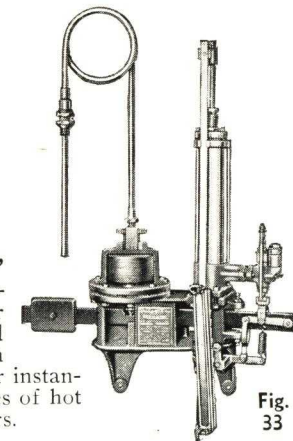


Fig. 33

Solenoid Valves

Fig. 240 Snap Action Solenoid Valves—For general service in cast iron or cast steel construction for high pressures, trimmings of composition or stainless steel. Made in sizes 1 to 4 ins., inclusive.

Fig. 111 Electro-temp Controller—A combination reducing valve and temperature limit controller. Will maintain average temperature of water within 2 to 5 degrees. Suitable for 110 or 220 volts, 60 cycle, 3 phase. Control circuit may be single phase. Adaptable where

ever hot water control is required. Cast iron body, composition interiors, or cast steel body with stainless steel interiors. Made in sizes from 1 to 4 ins., inclusive.

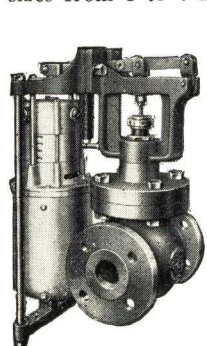


Fig. 245

Fig. 245 Thrustor Operated Valves—For high pressures and high total temperatures, made in either cast iron or cast steel with corresponding interiors of composition or stainless steel. Smooth in operation and consume very little current. Made in sizes 1 to 12 ins.

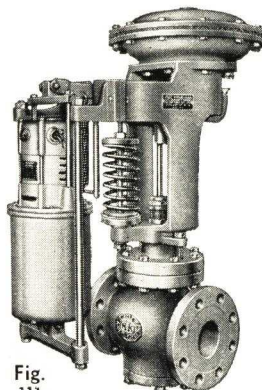


Fig. 111

steel with stainless steel interiors. Sizes 1 to 12 ins.

Fig. 246 Motor Operated Valves—Of rugged construction in either cast iron or cast steel as conditions require. Embody novel features which

permit positive seating and unseating of valve without overloading the electric motor. Made in sizes 1 to 3 ins. of design shown.

In similar design with some modifications in larger sizes up to 24 ins.

Fig. 215 Electrically Controlled Servo Motor Operated Gate Valve—

For use wherever an electrically controlled valve is desired. Adaptable

for use in conjunction with pressure, temperature, or float switches, as well as push button station. Suitable for pressures up to 150 lbs., and for any voltage or frequency. Made of cast iron, bronze trimmed, in sizes 2½ to 8 ins.

Fig. 246

Fig. 144-B Four-way Valves—For operation of double acting cylinders, power stroke in both directions.

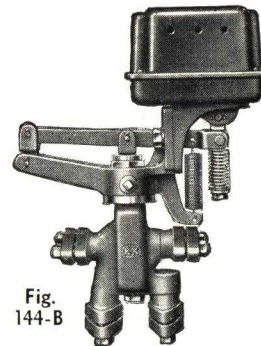


Fig. 144-B

Fig. 143-B Three-way Valves (not shown)—For operation of single acting cylinders where return of cylinder is by another force.

Both types can be arranged with double solenoids to remain in either position without continuous current application, or to return to neutral for positioning cylinders. For air, water, or oil. Not recommended for steam. Both types are made in all bronze, in sizes ¾ to 2 ins. inclusive.

Fig. S-300 General Service Valves—These are for general service on water, steam, oil, gas or air up to 200

lbs. pressure. With A.C. or D.C. solenoids, arranged for normally closed or open operation, when solenoid is de-energized. Made in sizes ¼ to 2 ins. inclusive. All bronze. Same valves of cast iron, cast steel and monel metal, where service conditions are such that bronze valves would not be suitable.

Catalogues

Write for a copy of our *General Catalogue* or *Bulletin "T"* on Solenoid Valves.

Engineering Service

Our Engineering Department will gladly help you solve your difficult control problems without obligation.

Fig. 229 Trip Valves—Solenoid operated, arranged for either normally open or closed circuit operation. Made in cast iron with composition interiors, or cast steel with stainless steel interiors. Sizes 1 to 12 ins.

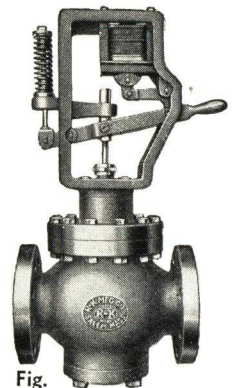


Fig. 229

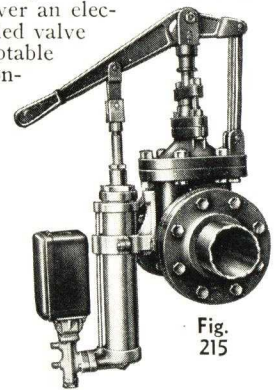


Fig. 215



Fig. S-300

THE SWARTWOUT COMPANY

Swartwout Power Plant Equipment

18545 Euclid Avenue, CLEVELAND, OHIO

For Ventilators, see our catalogue in Manufacturers' Index

Feed Water Regulation and Pump Control

"S-C" Feed Water Regulators are today serving the largest and highest pressure central station boilers, and giving equal satisfaction in the smallest low pressure industrial plant.

The present simple, powerful, and reliable "S-C" Feed Water Regulator is the result of more than twenty years' practical experience.

The complete line of Swartwout Feed Water Regulation and Pump Control equipment includes:

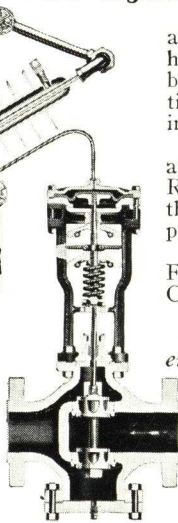
"S-C" Feed Water Regulators.
Differential Pressure Pump Governors without stuffing boxes.

Constant Pressure Pump Governors.

Differential Pressure Valves for controlling the pressure drop across feed water regulators.

Interlocking Master Controlled Pump Control Valves

"S-C"
Feed
Water
Regulator

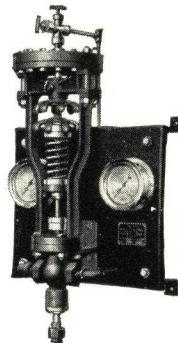


to automatically start or stop pumps as required.

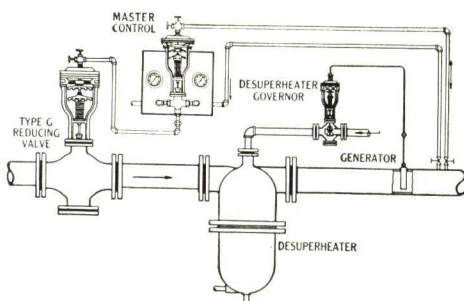
Pressure Regulation

The "S-C" Master Control shown at the right, is essentially an amplifier of pressure variations. It provides the basic method of pressure control in Swartwout systems. With it, effective control is provided for:

- (1) Single reducing valves;
- (2) Groups of valves;
- (3) Several valves operating progressively in parallel to handle wide load fluctuations;
- (4) Combinations of reducing and relief valves;
- (5) Motor rheostats;
- (6) Operating cylinders;
- (7) High pressure drops in a single step.



Desuperheating Equipment



desuperheating station is the "S-C" desuperheater governor, which is built in a variety of forms for the control of all temperatures encountered in practice.

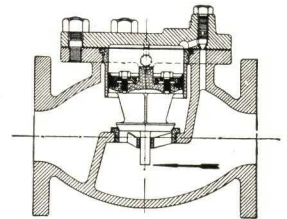
Master controlled pressure reduction can be combined with the station, as indicated in the diagram. Not only that, but any desired safety features can be incorporated to automatically protect the low side of the system from failure in cooling water, ruptured pipes, or other accidents.

A complete Swartwout Desuperheating and pressure reducing station is shown. The desuperheater itself is of the direct contact "carburetor type," and handles a wide range in load variation with uniform discharge temperatures. An important part of the

Liquid Level Control

The Swartwout Water Level Control Valve at the right is a cushioned, hydraulically operated valve. It is, however, only one of the many pieces of Swartwout equipment devoted to liquid level control.

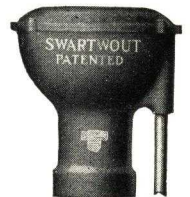
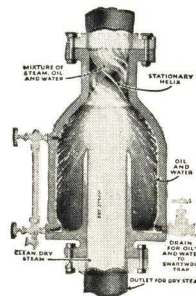
Swartwout equipment embraces means for controlling levels in open tanks, pressure tanks, elevated stand pipes, and heaters; controlling pumps and supply and overflow valves, in any necessary manner.



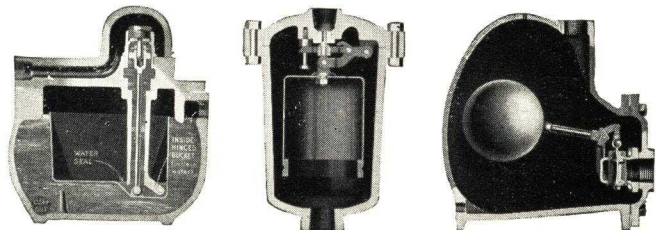
Separators and Exhaust Heads

Centrifugal force is the most effective separating means known today. Thorough separation is accomplished with a minimum of back pressure.

Swartwout cast iron exhaust heads are light and ornamental, and last a lifetime. Swartwout separators are made in all styles, for all pressures, and of all commercial materials. They are used to separate any liquid from any gas or vapor.



Traps—Condensate Control

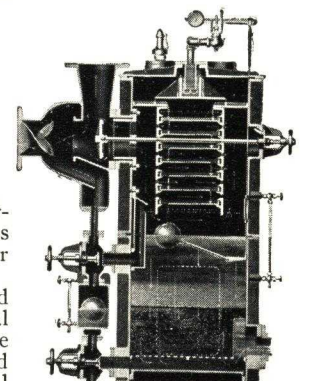


Swartwout offers a complete line of equipment for the control of condensate. First come the simple and conventional types of traps—open top bucket, inverted bucket, and low pressure float type—each with many individual features. Then the more elaborate boiler return and lifting traps. Finally, specialized equipment for the handling of unusually large quantities of condensate from evaporators, cookers, and the like; and for the draining of condensate at exceptionally high pressures.

Feed Water Heaters

Swartwout open type feed water heaters are complete with all the usual features and many that are not usually included. They are built in many special styles to fit particular requirements, such as extra water storage; and can be easily enlarged as plant requirements for hot water increase.

Deaerating heaters are provided with vent condensers and special deaerating features which reduce the oxygen content of the heated water to the lowest practical value.



Feed Water Heater

ARMSTRONG MACHINE WORKS

Manufacturers of Steam Traps

803 Maple Street, THREE RIVERS, MICH.

SALES AND SERVICE REPRESENTATIVES IN LEADING INDUSTRIAL CENTERS

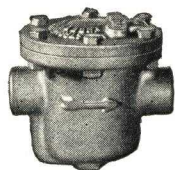
Armstrong Traps Can Be Obtained Through Any Jobber

A Specialized Product

For more than twenty years, the ARMSTRONG MACHINE WORKS has concentrated on the design, manufacture and application of inverted bucket steam traps. This specialization has resulted in a trap that will adequately meet any operating requirement and a sales and service organization competent to handle any steam trap problem.

Simplicity

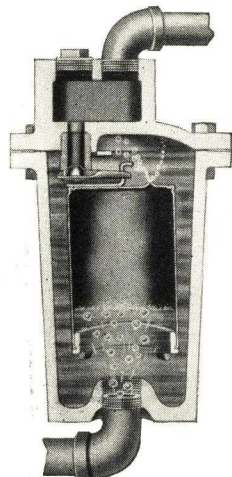
The Armstrong Steam Trap has only two moving parts—the valve lever assembly and the inverted bucket. When the trap is operating it is entirely filled with water. Steam entering the trap is caught in the inverted bucket. When this bucket is about two-thirds full of steam it floats, pushing directly up to close the valve without any undue jar or pressure. As additional water comes to the trap it displaces steam in the bucket, steadily reducing the buoyancy until the weight of the bucket, multiplied by the high leverage of the valve lever pulls the valve from its seat and water is discharged. This dual lever principle is a unique advantage of this design. Friction is practically eliminated in this mechanism. All wearing parts are made from nickel chrome steel except the discharge valve and seat which are made from a special chrome steel heat treated after machining to obtain maximum hardness and toughness. Many years of service without maintenance expense is the customary experience of Armstrong trap users.



No. 100 Trap



No. 213 Trap



Cross Section of Trap Showing Air Vent in Top of Bucket

Large Capacity

Discharge orifices used in Armstrong traps are very large in proportion to the size of the pipe connections. This is made possible by knife edges directly behind—and fulcruming directly on—the discharge orifice.

Armstrong trap capacity ratings show actual, continuous discharge capacities when handling condensate at steam temperature. The effect of flash steam and pipe friction to and from the trap is thus automatically taken into consideration. (See chart.)

Non-Air-Binding

Air mixed with steam very materially reduces the steam temperature and seriously retards the rate of heat transfer. Thus it is highly important that air be removed from all heating and process units.

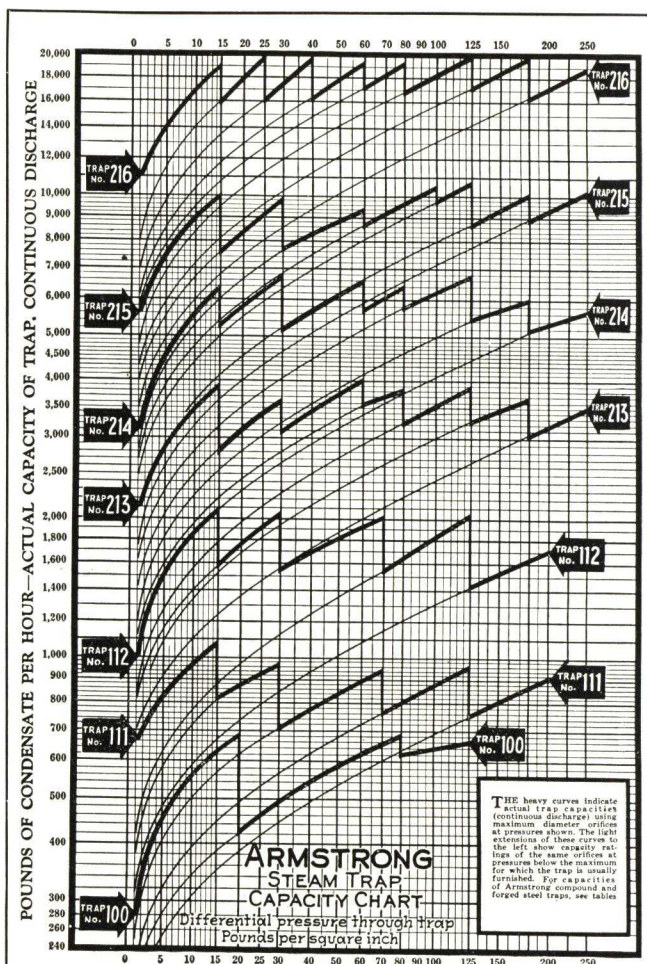
The air entering an Armstrong Trap rises through the vent in the top of the inverted bucket and is discharged ahead of the condensate. Any steam escaping through the vent is condensed to make up for the radiation loss from the trap.

Automatic Air By-pass

When large volumes of air such as contained in drum type dryers and pipe



coil radiation must be removed quickly, the air handling capacity of an Armstrong Trap can be increased approximately one hundred times by the use of a thermostatically controlled auxiliary air vent. As long as the trap is cold, the large vent will be wide open and it will be impossible for the bucket to float and close the valve. As soon as the air has been eliminated and steam reaches the trap, the auxiliary vent is closed by the bending of a strip of thermic metal and thereafter, the trap functions in the normal manner.



The Capacity Chart

The capacity chart shows actual continuous discharge capacities when handling condensate at steam temperatures. In order to secure intermittent operation and provide a factor of safety, the continuous discharge capacity of any trap should be at least twice as great as the amount of condensate to be handled. In many cases higher factors of safety are required—see pages 15 to 18 of The Armstrong Steam Trap Book.

Self-scrubbing

The large capacity of the Armstrong Trap means a very high water velocity under the bottom of the inverted bucket when the trap is discharging. This prevents sediment or sludge from accumulating at the bottom of the trap and instead, they are discharged along with the condensate.

Corrosion Resistance

Special corrosion resistant mechanisms can be furnished from any material available in sheet and bar form. Mechanisms are carried in stock to resist such acids as sulphurous, nitric and hydrogen sulphide as well as common alkalis.

High Pressure Traps

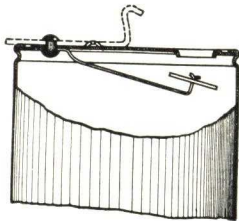
For pressures above 250 lb. and all conditions of superheat, forged steel traps are available in weights for 600, 900 and 1500-lb. pressure. The body and cap forgings are made from 0.25 to 0.30 carbon S.A.E. specification steel and the entire interior mechanism is made from nickel chrome steel except the heat-treated chrome steel valve parts. For physical data and capacities, see table B.

Compound Traps

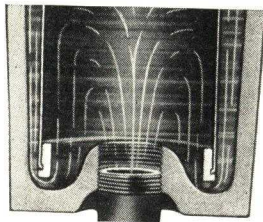
For handling exceptionally large volumes of condensate, Armstrong offers piston operated or compound traps in both the cast semi-steel and forged steel patterns. The piston-operated trap contains only three moving parts and practically straight line flow gives the trap very high capacity in proportion to the area of the main valve. For details, see table C.

Complete Manual on Steam Traps

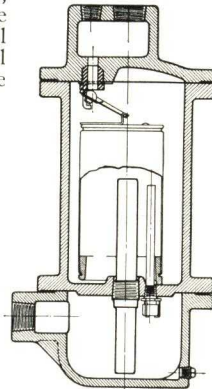
For additional information, write the ARMSTRONG MACHINE WORKS for a copy of The Armstrong Steam Trap Book, giving complete information on all phases of steam trap engineering.



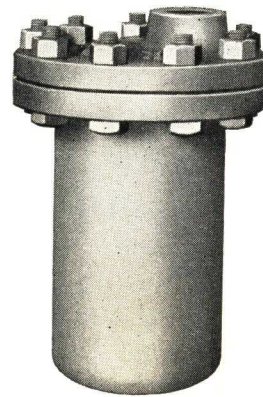
Auxiliary Air Vent Controlled by Thermic Strip



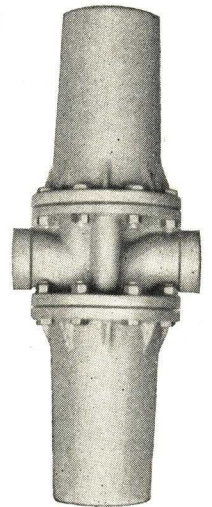
No Sediment Can Accumulate in the Trap



No. 223
For Pulsating Pressure



No. 315
For High Pressure Service



No. 235
For Big Condensate Volume

PRICES, SIZES AND CAPACITIES OF ARMSTRONG STEAM TRAPS**TABLE A—FOR LOW AND MEDIUM PRESSURES—CAST SEMI-STEEL BODIES**

Trap size.....	No. 100	No. 111	No. 112	No. 213	No. 214	No. 215	No. 216	No. 223	No. 225	No. 226
Type of service	For draining small units and drip lines			For general service, draining steam heated and power equipment				For use where there is a pulsation of pressure due to reciprocating engines or pumps, draining steam from the line. Similar to:		
Pipe connections, in..	1/2	1/2	1/2	1/2 or 3/4	1	1 or 1 1/4	1 1/2 or 2	213	215	216
List prices.....	\$7.00	9.25	15.00	20.75	29.00	38.00	55.00	1/2 or 3/4	1 or 1 1/4	1 1/2 or 2
Telegraph code.....	Alder	Aspen	Birch	Walnut	Hemlock	Larch	Tamarack	27.75	45.00	75.00
Height of trap, in....	4	5 1/2	7 1/4	10 1/4	12 1/2	14	16 3/4	Pine	Gum	Box
Diameter, in.....	4 1/4	4 7/8	5	6 3/8	7 1/2	8 1/2	10 3/16	13 1/2	18 1/4	22 1/4
Weight, lb.....	3 1/4	5	9 1/2	19	32	47	76	6 3/8	8 1/2	10
Max. pressure, lb....	125	200	200	300	300	300	300	300	300	300

For Actual Capacities of Above Traps, see Chart on Preceding Page.

TABLE B—FOR HIGH PRESSURES AND HIGH TEMPERATURES

Trap size.....	Forged Steel Bodies						
	No. 313	No. 315	No. 316	No. 413	No. 415	No. 416	No. 515
Pipe connections, in..	1/2 or 3/4	1 or 1 1/4	1 1/2 or 2	1/2 or 3/4	1 or 1 1/4	1 1/2 or 2	1 or 1 1/4
List prices.....	\$50.00	80.00	150.00	70.00	100.00	175.00	250.00
Telegraph code.....	Barium	Bismuth	Boron	Caesium	Calcium	Cerium	Titanium
Height, in.....	10 5/8	14 1/4	16 1/2	10 5/8	14 1/2	16 1/4	15 1/4
Diameter, in.....	8	9 3/4	11 7/8	8 5/8	10 3/4	12 1/4	12 1/4
Weight, lb.....	42	78	142	65	110	163	208
Max. pressure, lb....	600	600	600	900	900	900	1500
Pressure, lb.	Capacity in pounds of water per hour at pressure indicated, continuous discharge						
25							8800
50							11000
100							15000
150							18000
200							23000
250							26500
300	850	3500	7000				
400	950	2800	6000				
500	950	3050	6500				
600	1000	2100	4500	1000	2100	4500	
700				1050	2200	4600	
800				1075	2300	4700	
900				1100	2000	4800	2000

TABLE C—COMPOUND TRAPS

Trap size.....	Cast Semi-Steel Bodies			Forged Steel Bodies		
	No. 233	No. 235	No. 237	No. 333	No. 335	No. 337
Pipe connections, in..	1	2	3	1	2	3
List prices.....	125.00	175.00	225.00	220.00	300.00	360.00
Telegraph code.....	Apple	Apricot	Almond	Peach	Pear	Plum
Height, in.....	19	26 3/4	32	21 1/8	28 3/4	33 5/8
Diameter, in.....	8 1/2	10 1/2	14	8	9 3/4	11 7/8
Weight, lb.....	41	101	165	112	226	383
Max. pressure, lb....	250	250	250	600	600	600
Pressure, lb.	Capacity in pounds of water per hour at pressure indicated, continuous discharge					
25	8800	25000	63000	8800	25000	63000
50	11000	31000	75000	11000	31000	75000
100	15000	41500	95000	15000	41500	95000
150	18000	52000	119000	18000	52000	119000
200	23000	63000	139000	23000	63000	139000
250	26500	73500	160000	26500	73500	160000
300				30000	80000	175000
400				32500	92500	205000
500				35000	100000	225000
600				37000	105000	240000
700						
800						
900						

SARCO COMPANY, INC.

Manufacturers of Steam Specialties

183 Madison Avenue, NEW YORK, N. Y.

SARCO CANADA LIMITED, Federal Building, TORONTO, ONT., CANADA

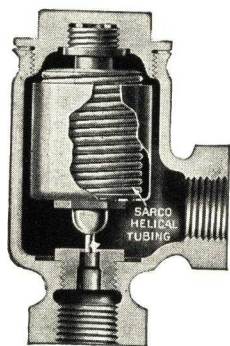
BRANCHES IN PRINCIPAL CITIES

Products

SARCO STEAM TRAPS, TEMPERATURE REGULATORS, STRAINERS. Also Radiator Traps, Packless Inlet Valves, Air Eliminators, Return Traps, Alternating Receivers, Compound Gauges, Damper Regulators, Pipe Savers, Dial and Recording Thermometers, etc.

Sarco Steam Traps, Types 9, 7 and S-75

Type No. 9—This is a thermostatic trap, suitable for individual trapping of all types of steam heated equipment. It is low in first cost, of small size and easy to install, going into the pipe like a fitting.

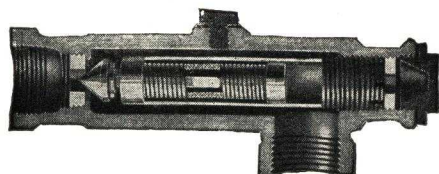


The No. 9 trap is self-adjusting and works equally well on steady or fluctuating pressures. The discharge valve is operated by a helical bellows containing a volatile fluid. The moment live steam reaches the trap this fluid expands and closes the valve tightly. As condensate collects, the bellows contracts and opens the valve. Will not stick, freeze or air bind.

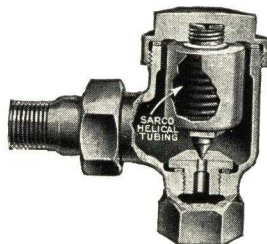
Type 9-1 for pressures 0 to 30 lb. Brass valve head and seat.

Type 9-2 for pressures from 0 to 100 lb. Stainless steel valve head and seat.

Type No. 7 (below)—This trap utilizes the hydraulic pressure of a heavy hydrocarbon oil hermetically sealed in a metal tube. Due to the irresistible force of expanding oils, this trap is unfailing in action.

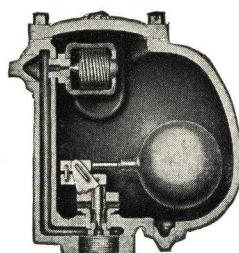


A simple adjustment enables the user to adapt the trap for use at various pressures.



Type No. S-75 (at right) for Process Steam—Employs the same principle as the No. 9 Trap, but has union inlet connection and nickel-plated body. It has renewable stainless steel valve head and seat. Recommended for installations where process steam is used up to 100 lb. pressure. Write for Catalog L-48.

Sarco Combination Float and Thermostatic Steam Trap FT-3



For heavy service, where large quantities of very hot condensate form more rapidly than they can be handled by thermostatic means alone, such as large unit heaters, steam coils, hot water service tanks, etc., when using high pressure steam.

Body is cast iron, light enough to be supported directly on piping. A

heavy seamless copper float opens the discharge valve through a simple toggle mechanism, as condensate accumulates in the trap. Valve head and renewable seat are stainless steel to withstand the scoring action of scale and sediment, and prevent wire drawing.

A thermostatic air vent is built right into the trap near the top. This consists of a small valve actuated by a helically coiled bellows, partly filled with a volatile liquid. The valve is held open as long as there is air in the trap, but closed tightly as soon as steam reaches it and causes the bellows to expand.

Large cover to body provides ready access.

For pressures up to 125 lb. per sq. in. Write for Catalog L-47.

Sarco Temperature Regulator—From 0° to 300° F.

Sarco Temperature Regulator is operated by an extremely sensitive liquid and is instantly responsive to the slightest fluctuation in the temperature of atmosphere or liquids. It requires no external operating means, such as compressed air, water or electricity.

Sarco Regulators are substantially constructed. The valve is balanced and packless.

Suitable for steam, water, oil and gas, and can also be had in the "reverse acting" type, to open with rise of temperature.

A 6-ft. connecting tubing between thermostat and valve is furnished with regulator, but when needed, longer tubings are supplied at a slight additional cost.

Type TR-21 is designed for tank, heater, steam jacket and duct control, and has an adjustment range of 30° F.

Type KR-14 is designed for room and dry kiln control and has an adjustable range of 30° F.

Types KR-25 and TR-25 have a range of 100° F. The latter is designed for liquid, the former for room control. Write for Catalog L-52.



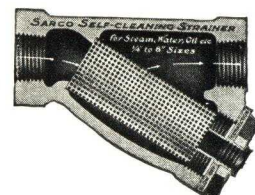
Sarco Self-cleaning Strainer

Sarco Strainer is suitable for use on steam, gas, water, oil, etc. It has a cast iron body with perforated cylinder placed at such an angle as to offer minimum obstruction to the flow of gas or liquid, but allowing ample cleaning space. The standard screens are made of perforated brass, but where specified, monel or other metal screens can be supplied to practically any specifications.

Can be placed in horizontal or vertical lines or at any angle. A blow-off connection permits the strainer being cleaned instantly merely by opening the valve.

Made in sizes from 1/4 to 8 in.; also furnished with brass bodies, caps and screws in sizes 1/2 to 1 in. inclusive.

Write for Catalog L-67.



THE AMERICAN METAL HOSE COMPANY

Manufacturers of Flexible Metallic Hose and Tubing for All Services
WATERBURY, CONNECTICUT

SALES OFFICES AND AGENCIES

NEW YORK, N. Y., 25 Broadway

PITTSBURGH, PA., 505 Minton Street

CHICAGO, ILL., 1326 W. Washington Boulevard

CANADA: Lytle Engineering Specialties Ltd., MONTREAL, CANADA

PACIFIC COAST: F. Somers Peterson Co., SAN FRANCISCO, CAL.

Material and Uses

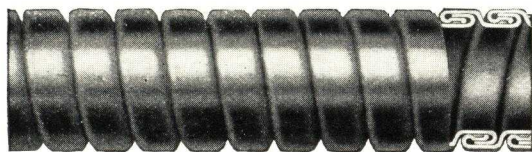
There are two broad classifications of American Flexible Metal Hose: (1) That constructed from a continuous metal strip which is first profiled into the desired shape and then spirally wound over itself; (2) That formed from chasing a deep, continuous groove in a piece of seamless, drawn tubing. In each of these basic classifications various types of hose have been developed to meet specific service conditions.

A large percentage of hose problems result from the use of hose unsuited to the work in question, or to suitable hose being improperly installed. THE AMERICAN METAL HOSE COMPANY has for twenty-three years specialized in the manufacture of flexible metal hose and in every case aims to provide the one type of hose best suited to specific requirements. A technical department, maintained for the purpose, offers its service and experience in the solution of hose problems. Every recommendation is made with genuine interest in the satisfaction of its customers, and behind every length of hose sold is the reputation and high manufacturing standard of this Company.

American Flexible Metal Hose, while applicable to all purposes for which hose is used, is primarily a heavy service hose suitable for the most severe classes of work as well as for service where chemical action or intense heat limits the life of rubber hose. The most popular and widely used styles of American Flexible Metal Hose are described below. Catalogues and literature giving details on Flexible Vacuum Hose, Carburetor Tubing, Heater Tubing, Exhaust Tubing, Conduit, Suction and Blower Hose, etc., are available for your files. Our large catalogue on Flexible Metal Hose, Tubing and Conduit for all kinds of industrial machinery and plant uses, will be sent upon request.

Steam Hose

American Flexible Bronze Hose (Types BD15 and BD20) for steam. For normal services and pressures the BD15 or unbraided interlocked bronze hose is used. For services where the hose is subjected to high pressures, constant bending or rough handling, BD20 (wire braided) hose is recommended on account of its greater strength. In case the steam is superheated, a galvanized steel hose is preferable to the bronze. Flexible Metallic Steam Hose easily withstands the effects of heat, moisture, and high pressures. It will not vulcanize or crack. Iron pipe thread couplings corresponding to the inside diameter of the hose are threaded onto the profile of the hose and made tight with a "stuffing box" of asbestos and boiler cement. They can not blow off. Among the more common uses for Flexible Metallic Steam Hose are blowing out boiler flues and for steam heating tank cars prior to unloading them.



BD15 Type of Hose—Unbraided, Interlocked Steel or Bronze
Sizes $\frac{1}{2}$ to 8 in. inside diameter, inclusive



BD20 Type of Hose—Steel or Bronze Hose, Steel or Bronze Braided
Sizes $\frac{1}{2}$ to $1\frac{1}{4}$ in. inside diameter, inclusive

Oil Hose

American Flexible Galvanized Steel Hose (Types BD15 and BD20) for oil. As in the case of steam hose, BD15 or unbraided hose is recommended for normal services and pressures, and BD20 or braided hose for hard services and high pressures. Oil hose couplings carry a pipe thread corresponding to the inside diameter of the hose and as a general rule are attached with solder. Oils have a beneficial rather than a deteriorating effect on flexible steel oil hose as they lubricate the joints, insuring the maximum of flexibility and also act as an additional rust preventive. A few of the best known uses for flexible steel oil hose are as flexible lubrication lines, conveying oils and cutting compounds, and unloading tank cars. On tank car unloading hose, a 45° elbow coupling, threaded to fit the special thread on tank car outlets, is soldered to one end of the hose and a swivel female iron pipe thread coupling to fit the outlet of the storage tank is soldered to the other end.

American Seamless Flexible Tubing

Formed from a seamless drawn solid tube into which helical corrugations or grooves are machined to impart the necessary flexibility. It is a radically new development, a new and improved type of flexible metal hose that is resilient, unusually flexible, and of such strength as to permit its use for conveying oil, air, steam, ammonia, penetrative gases, and volatile liquids at considerable pressures. Due to its construction and the absence of joints, seams, welds or brazes, it is absolutely leak-proof and airtight. Tubing is usually fabricated from a special



Open Groove



Closed Groove

high copper content alloy or from steel, but various other alloys can be used when substance to be conveyed would be injurious to these metals. Entirely suitable for moderate pressures without any outside covering. For extremely high pressures it can be reinforced by one or more braidings of phosphor bronze or galvanized steel wire.

Couplings for seamless tubing are either of the soldered, packed-on-heat-proof, or welded type, depending on temperature and service to be met. We are equipped to furnish fittings for all sizes of tubing with any thread, standard or special, in any of these styles.

Seamless Flexible assemblies are used for conveying liquid ammonia or SO₂ gas in charging and dehydrating refrigerator units; for conveying illuminating gas; for connecting platens on steam heated presses; for oil and gasoline lines on airplanes, motor boats, automobiles, tractors; for hydraulic feeds and speed mechanism on machine tools; and for absorption of shock or impact pressures between moving members of a machine. When protected with two braidings of galvanized steel wire and equipped with packed couplings, American Seamless Flexible Tubing is listed as standard by the Underwriters' Laboratories for oil, gas, or air lines on burner equipment. Sizes, $\frac{1}{2}$ to 2 in., inside diameter.

THE GARLOCK PACKING COMPANY

GENERAL OFFICES AND FACTORIES

PALMYRA, N. Y.

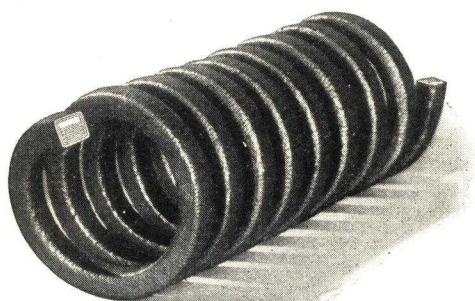
IN CANADA: The Garlock Packing Company of Canada, Limited, Montreal, Quebec

CANADIAN FACTORIES: HAMILTON, ONTARIO

A World Wide Organization with Sales Offices and Warehouses in All Principal Industrial Centers

Range of Garlock Products

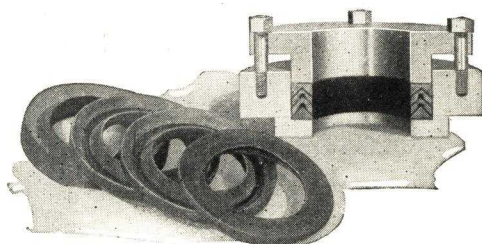
THE GARLOCK PACKING COMPANY manufactures in its own factories a complete line of Quality Controlled Mechanical Packings and Asbestos and Rubber Products.



Garlock 150 High Pressure Packing

Rod Packings

Asbestos, rubber, flax, semi-metallic, full metallic and combination packings of every description, for service against hot or cold water, steam at any pressure or temperature, air, ammonia, gases, hot or cold oils, acid and alkali solutions and process liquors of every kind.

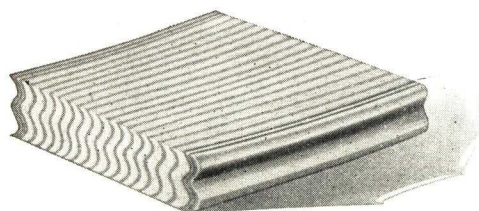


Garlock Chevron Packing (Patented)

A recent and outstanding development of the Garlock factories is Garlock Chevron, an automatic packing, designed and recommended for extreme heavy duty service. Use Garlock 430 Chevron for hydraulic service. For high temperatures use Garlock 530 Chevron.

Sheet Packings

Our complete line of sheet packings includes:
 Garlock 22—Red rubber sheet.
 Garlock 24—Wire inserted red rubber sheet.
 Garlock 19—Duck inserted rubber sheet.
 Garlock 353—Oil resisting black rubber sheet.
 Garlock 660—Cork-fibre sheet for gasoline, oil and water.
 Garlock 900—Compressed asbestos high pressure steam sheet.
 Garlock 7021—Asbestos sheet for hot oils and gasoline.
 Garlock 619—Diaphragm sheet.



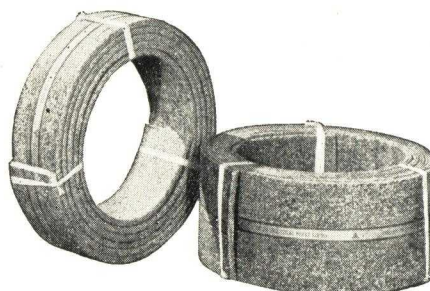
Garlock Guardian Gasket (Cross-section View)
(Patent Applied For)

Gaskets

Gaskets in any size and of every type including the new resilient Garlock Guardian semi-metallic gaskets.

Belting

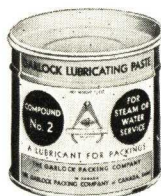
Garlock Rubber Transmission Belting is a superior belting for long and dependable service. It has unusual flexibility, remarkable gripping power and great strength.



Garlock 701 Industrial Brake Lining

Brake Lining

Garlock 701 Industrial Brake Lining is constructed of high quality asbestos cloth impregnated with a special rubber compound, then folded, molded and vulcanized under 2000 lbs. pressure. Gives long service on all industrial equipment.



Garlock Lubricating Paste

Improves the performance of packings in service and makes them last longer. Compound No. 2 is for packings operating against steam and water. Compound No. 3 is for packings operating against gasoline and oils.

Catalogue

Full description of our standard products is contained in our B-1932 Catalogue. A special Metal Packing Catalogue contains valuable metal packing information. Write for these books. A Garlock Representative is in your vicinity. He will gladly call upon request.

GOETZE GASKET & PACKING COMPANY, INC.

15 Allen Avenue
NEW BRUNSWICK, N. J.

Products

Standard and custom-made metallic and composition gaskets, sheet packing and valve discs. Goetze Gaskets are dependable for any pressure, temperature and fluid and meet every industrial requirement.

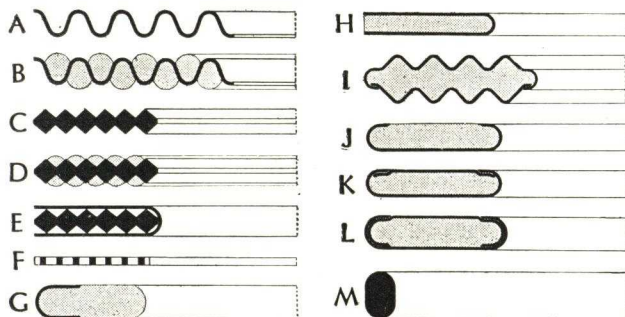
The metallic types eliminate special fitting, slip in and come out easily, leave the flange surfaces smooth and can be used repeatedly.

Pioneers in Gasket Design and Construction

This company has for 45 years concentrated its efforts solely upon problems involving fluid and pressure tightness at joints and connections, has originated many of the accepted standard gasket types, and is thoroughly qualified to meet every gasket requirement of standard and special industrial equipment.

The name Goetze on gaskets and packing is the stamp of exacting care in manufacture, rigid inspection and uniformly fine quality—all assuring perfect efficiency and high economy in service.

Popular Constructions



A: Plain corrugated metal. B: Corrugated metal with asbestos cord inserts. C: Profiled solid metal. D: Profiled metal inserts. E: Profiled solid metal with outside-open metal jacket. F: Perforated metal. G: Woven asbestos with inside-open metal jacket. H: Asbestos in outside-open metal jacket (French type). I: Asbestos core in corrugated metal shell. J: Asbestos with double-edged metal jacket, one face of asbestos partly exposed. K: Asbestos fully enclosed in two-part metal jacket. L: Asbestos fully enclosed in double metal shell. M: Solid metal. Made with rounded sections for ring type joints or with rectangular section.

Together the above designs offer wide selection for any pressure, temperature, vibration, rough surface, resistance to erosive and corrosive conditions, and for protecting the fluid handled from contamination.

Where previous trouble has been encountered from exceptionally severe conditions, our Service Engineers will suggest proper selection and explain their reasons therefor.

These designs can be furnished with any desirable filler and in copper, Armco Iron, stainless steel, Monel Metal, aluminum, or other metal.

The material combinations and sizes in greatest demand are carried in stock in large quantities, and others can be made up on short notice.

Even gaskets of the largest usable dimensions are made seamless.



Reg. U. S. Pat. Off.

Goetze Boiler Gaskets

All shapes and desirable construction types. Those for popular makes of boilers carried in stock.

Heat Exchanger Gaskets

Made to any special design with plain or intricate shape and absolute lasting tightness under previously baffling conditions.

Goetze Drum Plug Gaskets

Thoroughly tight against leakage and evaporation. Positive as lock washers in producing *sustained* tightness even under jarring and temperature change. No shellacing or great force necessary in setting. Millions used by oil refineries. Standard in $\frac{3}{4}$, $1\frac{1}{2}$ and 2-in. sizes and every desirable material combination.

Goetze Valve Discs

Alternating rings of asbestos and steel completely encased in metal shell, and sealed against disc holder by an asbestos top ring. Resilient, durable and excellent for uninterrupted service. Copper shell and round or oblong hole. Also furnished with Monel Metal or stainless steel shell. Valve sizes $\frac{1}{4}$ to 12 in.



Goetze Valve Discs

Goetzerit Sheet Packing

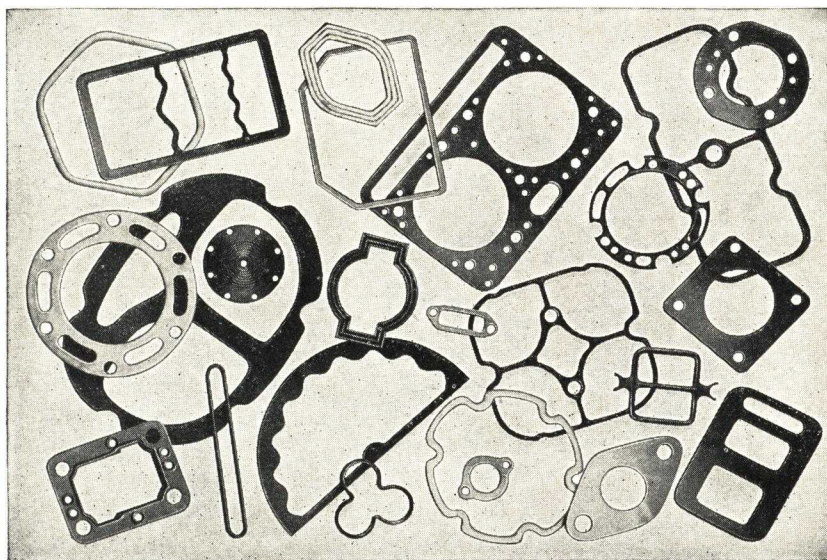
For low cost or emergency use in general service. Consists of long-fibre asbestos impregnated with a composition which increases tensile strength and retains pliability, flexibility and resilience to conform to all requirements. Furnished in 50x50-in. sheets, $\frac{1}{32}$, $\frac{1}{16}$ or $\frac{1}{8}$ in. thick or cut into gaskets of any size and shape.

Engineering Service and Literature

The facilities of this company include an able Engineering Staff, long research, fabricating and testing experience, a corps of highly skilled operatives and the very best equipment for quality production at lowest consistent cost.

Prospective customers having design and operating problems are invited to avail themselves of free Engineering Service, and will gladly be given competent and conservative advice upon our receipt of full particulars.

Literature on all standard Goetze Gaskets, and data on desirable gasket and joint construction will be sent free to any plant owner or supervising or operating engineer.



Gaskets of Special Designs and Shapes Made to Order

GRATON & KNIGHT COMPANY

358 Franklin Street
WORCESTER, MASS.

LEATHER PACKINGS

Packing Engineering Service

More than 25 years' experience in manufacturing Standard Packings and developing special Packings for unusual conditions is at your service. You can have the benefit of every facility for solving Packing problems—our Research Laboratories—Engineering Department—and the modern, completely equipped Department for Packing manufacture. Our Packing Engineers will welcome the opportunity to help you.



Cup Packings

Tannages Used

The wide range of conditions under which Leather Packings must operate makes it necessary to supply different tannages, shapes and finishes to meet specific requirements. GRATON & KNIGHT COMPANY tan Oak, Chrome and Spartan Leathers.

For ordinary conditions, packings made from Graton & Knight Oak Leather are satisfactory.

Spartan Leather

Spartan Leather, tanned by an exclusive Graton & Knight process, gives remarkable service under the most adverse conditions. It is exceptionally tough, pliable and wear resisting. It withstands to an unusual degree high temperatures, hot and cold water, oil, gas and acid fumes. It will not "take water" and swell. It will not dry out hard or shrink to any appreciable degree. We highly recommend it for packing service.

Spartan Packings

Spartan Packings are especially successful in Hydraulic Presses, Hot Water Pumps, Elevators, Milking Machines, Gasoline Pumps, or wherever high temperatures, oil or other adverse conditions exist.

Hydraulic Packings—Designed to work in water, oil or other liquids. Used on Hydraulic Presses, Baldes Cotton Seed Oil, Linseed Oil Presses, etc.

Pneumatic Packings—Made to hold air pressure. Used in Air Brakes, Pneumatic Devices for doors on electric cars, busses and elevator doors, in air hoists, etc.

Packings for Dispensing Liquids—Such packings are used in gasoline, oil and alcohol pumps, etc. For this service *Spartan* is especially adapted. This is true where gasoline and alcohol are used because such liquids completely degrease leather. When the grease has been extracted from most tannages, the leather dries out, becomes hard and brittle and cracks easily. *Spartan* Leather does not harden and become brittle, but retains its original pliability.



U Packings

General Information

Packings for Hydraulic Service—These are treated to resist pressure. Generally the kind and amount of treatment depends upon the number of pounds pressure under which the packings operate.

Packings for Pneumatic Service—These are treated to make the leather impervious to air. There can be no hard and fast rule laid down for the treatment of hydraulic or pneumatic packings.

There are many cases where the design of the equipment or heat conditions make it necessary to manufacture the packing especially for the job.



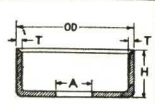
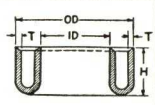
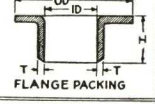
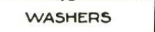
Flange Packing

When Specifying Leather Packings

Because of our daily experience in producing packings to meet all conditions of service, we can be of great assistance to the packing user in recommending and furnishing the particular type of packing which will most economically meet the requirements.

Therefore, when you have a packing problem, give us complete information. Such information should include the kind of service—that is, hydraulic or pneumatic—number of pounds pressure, whether subjected to heat and, if so, the amount. Any other unusual conditions which may affect the service should also be given.

For convenience in giving dimensions when submitting packing problems or ordering, we shall be glad to furnish (without charge) forms similar to that shown here:

QUANTITY	OD OUTSIDE DIAM.	A HOLE	H HEIGHT	T THICKNESS
				
CUP PACKING				
				
U PACKING				
				
FLANGE PACKING				
				
WASHERS				

Packing Specification Form

Our Packing Engineers will welcome the opportunity to work with you on any packing problem. Write us at the address above.

The cost of installation and lost time from idle equipment is many times the cost of the right packing for the job.

PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.

Paschall Post Office
PHILADELPHIA, PA.

BRANCH SALES OFFICES

CHICAGO, ILL., 162-66 North Clinton Street
NEW YORK, N. Y., 30 Church Street

CLEVELAND, OHIO, 3030 Euclid Avenue
HOUSTON, TEX., 2410 McKinney Avenue

BOSTON, MASS., 120 High Street
NEW ORLEANS, LA., 908 South Peters Street

U. S. FLEXIBLE METALLIC TUBING CO.

336 South San Pedro Street
LOS ANGELES, CAL.

63 Main Street
SAN FRANCISCO, CAL.

315 Occidental Avenue
SEATTLE, WASH.

Products

"PENFLEX" FLEXIBLE GALVANIZED STEEL OIL HOSE.

"PENFLEX" FLEXIBLE BRONZE STEAM HOSE.

"PENFLEX" PNEUMATIC RIVET PASSER.

Also Gas Tubing, Gas Holder Heating Hose, Gasoline Hose, Conduit Hose, Marine Hose, Automatic Barrel Filler.



"Penflex" Galvanized Steel Oil Hose

"Penflex" galvanized steel oil hose is suitable for conveying oil, gas, gasoline, paint, hot tar, etc. Made in all regular sizes and for all required working pressures.

"Penflex" is an all-metal hose that consists of a continuous length of galvanized steel (or bronze) rolled in a spiral so that the edges interlock and form the four-wall construction shown in the illustration (Fig. 100). As the metal is rolled, a groove is formed, containing an especially prepared asbestos packing which remains fully protected from internal or external wear.

The "Penflex" interlocking joint permits unusual flexibility without straining or bending the metal.

"Penflex" metal hose is light in weight,

yet it has exceptional strength, durability and safety—it will not kink, collapse, burst, stretch, swell, crack, corrode or leak.

It is unaffected by any degree of temperatures or climatic conditions and *always remains flexible*. Maintains full area and capacity throughout its entire length and through the couplings.

Give the following information when making inquiries:

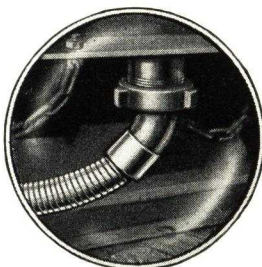
Purpose for which hose is intended.

Working and test pressures required.

Inside diameter and length.

Style and size of couplings wanted on each end.

Write for Bulletin No. 59A.



How a "Penflex" Galvanized Steel Oil Hose with Tank Car Unloading Coupling Is Used

Write for Bulletin No. 55C

"Penflex" Bronze Steam Hose

"Penflex" bronze steam hose with its distinctive four-wall, interlocking construction is made to withstand the heaviest pressures and highest temperatures in regular, constant service.

It meets all the requirements of the steam user, always retains its flexibility, is unaffected by climatic conditions, combines strength with lightness, and insures safety to the user as it is so strongly constructed that it will not burst or blow off couplings.

Each length of hose as it comes from the machines is subjected to hydrostatic pressure test—pressures far in excess of that encountered even under the most abnormal working conditions.



There is practically no limit to the adaptability of "Penflex" bronze steam hose. Wherever a flexible connection is required it will be found to give unlimited satisfaction.

Made in all regular hose sizes and to all required working pressures.

Ask for Bulletin No. 52D describing "Penflex" bronze steam hose.

"Penflex" Heavy Duty All-metal Tank Car Unloading Hose Assemblies

Ask for Bulletin No. 55C which fully describes these tank car hose assemblies.

Special assemblies supplied for handling molasses.

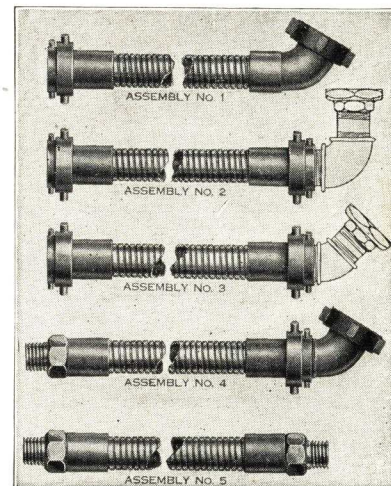
"Penflex" Pneumatic Rivet Passer

A machine operated by compressed air which passes rivets safely, surely and accurately.

It is easy to operate and maintain, requiring practically no mechanical knowledge.

It is a necessity for bridge and "ship hold" work and a decided advantage on all riveting jobs.

Fully described in Bulletin No. 25A.



"Penflex" All-metal Heavy Duty Tank Car Unloading Hose Assemblies



"Penflex" Pneumatic Rivet Passer

TITEFLEX METAL HOSE CO.

503 Frelinghuysen Avenue, NEWARK, N. J.

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LOS ANGELES, CAL., 1835 So. Hope St.

SEATTLE, WASH., 1530 11th Avenue
PORTLAND, ORE., 9th and Glisan Sts.

TITEFLEX—THE ALL-METAL FLEXIBLE HOSE AND TUBING

Products

FLEXIBLE ALL-METAL BRASS TUBING.
FLEXIBLE ALL-METAL STEEL TUBING.
FLEXIBLE ALL-METAL BRONZE TUBING.
FLEXIBLE ALL-METAL EXHAUST TUBING.

Titeflex All-metal Flexible Hose

For more than sixteen years Titeflex All-metal Tubing has been successfully used to solve the problem of a flexible metal connection in the commercial and industrial fields where it has proved its efficiency and dependability under severe service conditions. It is used as plant equipment by manufacturers in varied lines because of its adaptability and wide range of applications in industry. Titeflex is furnished as standard or original equipment by organizations manufacturing and marketing machines or devices requiring a flexible metallic connection of quality.

Titeflex All-metal Tubing differs in construction from all other types of flexible metal hose and tubing. It is fabricated under a patented process and because of its distinctive features it exhibits marked characteristics most desirable in a flexible connection. Titeflex is the only pressure-tight flexible tube made of metal strip that does not rely on an interlocked *sliding* joint to produce flexibility. Titeflex is all-metal. Because of this all-metal construction the tube is inherently tight for the carrying of liquids and gases.

Special Features—The product of the TITEFLEX METAL Hose Co. is made of a profile strip spirally wound into a convoluted tube having a double locked fixed seam on top of each convolution. Through the convolution and diaphragm construction, this tubing attains a high degree of flexibility, while its strength and tightness is assured by the pressure-tight double locked fixed seam on top of the diaphragm section. This seam is rolled under heavy pressures, making a homogeneous mass of metal. Titeflex is inherently tight due to this unique construction.

Where great flexibility is desired, single fine wire braid is supplied on Titeflex, and a double braid where the conditions are more severe, particularly where high internal pressure is encountered. The flat ribbon braid is used when flexibility is not the essential quality but the absorption of vibration is desired and mechanical support to the tubing is sought. An interlocked armor may be used over the braided Titeflex tube to give added protection and reinforcement against handling, or when forced bends are liable to occur.

The seam in Titeflex being permanently fixed and free from any internal rubbing action will show no appreciable deterioration after long periods of use. The absence of



organic material that can be detached or dissolved insures the purity of the liquid conveyed, and the original capacity and reliability are maintained in all Titeflex assemblies.

Approvals and Listings—

Bureau of Steam Engineering for U. S. Navy.

United States Shipping Board for oil burners.

Bureau of Construction and Repair for U. S. Navy.

Underwriters' Laboratories, O. B. Line oil burners.

Department of Commerce, fuel lines, licensed aircraft.

Underwriters' Laboratories, carrying flammable liquids.

U. S. Bureau of Standards—100 per cent efficient for gas.

American Gas Association Testing Laboratory.

Inspection—Every piece of Titeflex is carefully inspected throughout the process of manufacture and is finally subjected to pressure tests materially higher than that of service.

SIZES AND SPECIFICATIONS OF STANDARD TITEFLEX TUBING

Approx. I.D., inches.....	$\frac{5}{32}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
Approx. O.D., in., single braid	.33	.43	.51	.59	.79	1.03	1.38	1.66	2.00	2.47	3.25	
Approx. O.D., in., dbl. braid	.36	.47	.56	.65	.84	1.10	1.42	1.70	2.09	2.51	3.29	3.87

Couplings—We supply all pipe threaded and S.A.E. fittings for the corresponding sized tubings. This includes the male, female and union connections for both classifications of couplings. More detailed information on request.

Applications—Flexible connections to carry the following:

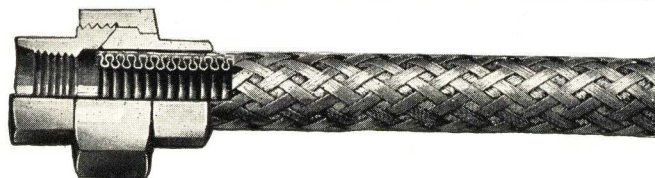
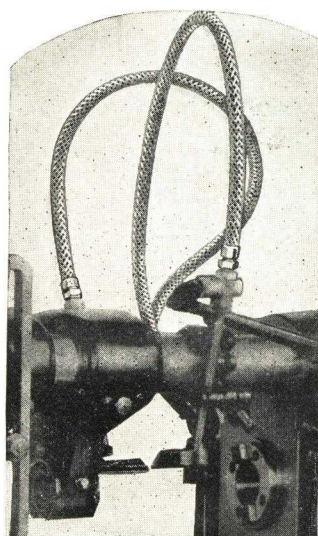
Gas	Oxygen	Cutting
Oil	Tallow	Compounds
Air	Grease	Acetylene
Water	Exhaust	Asphaltum
Steam	Varnish	Lubricants
Paint	Hot air	Tooth paste
Starch	Alcohol	Tar products
	Gasoline	

Instructions for Ordering Titeflex

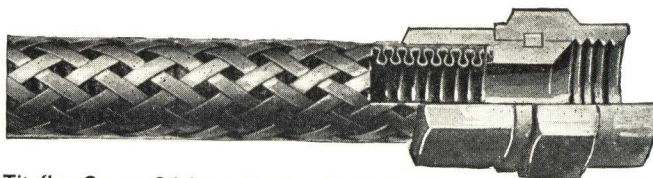
(1) Material to be conveyed. (2) Maximum pressure to be carried. (3) Nature of service to be performed. (4) Inside diameter of the tubing wanted. (5) Kind, size and thread of couplings required. (6) If there is a temperature element, advise degree of heat encountered. (7) The exact length of each piece between faces of parts to be connected.

Catalogue

Descriptive Catalog No. 109 sent on request.



Titeflex Line for High Pressure Industrial Service Showing Double Braid, Inner Tube and Pipe Union



Titeflex Gas or Oil Line, Showing Single Braid, Inner Tube and S.A.E. Union Coupling

PUMPS AND COMPRESSORS

. . .

ENGINES, TURBINES AND WATER
CONTROLLING APPARATUS

. . .

LUBRICATION

PENNSYLVANIA PUMP AND COMPRESSOR CO.

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BOSTON, MASS.
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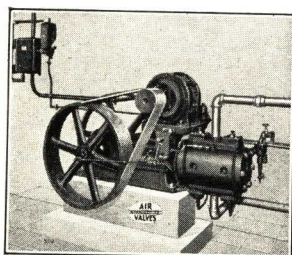
INDIANAPOLIS, IND.
LOS ANGELES, CAL.
MILWAUKEE, WIS.
MINNEAPOLIS, MINN.
SEATTLE, WASH.

NEW HAVEN, CONN.
NEW YORK, N. Y.
PHILADELPHIA, PA.
PITTSBURGH, PA.
TULSA, OKLA.

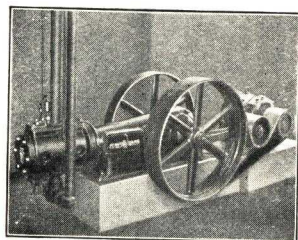
READING, PA.
ROCHESTER, N. Y.
SAN FRANCISCO, CAL.
SCRANTON, PA.

Products

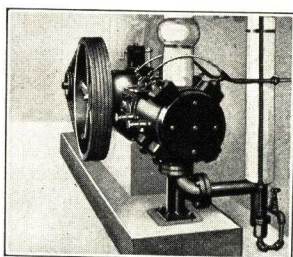
AIR COMPRESSORS, GAS COMPRESSORS, STEAM COMPRESSORS, WATER



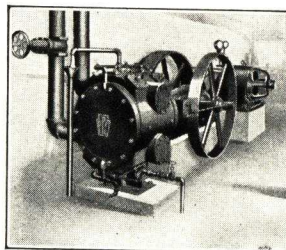
3-A Single-stage Compressor,
Overhead Multiple Belt Drive
Cat. 155-S



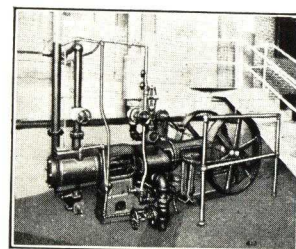
3-A Single-stage Compressor,
Short Belt Drive
Cat. 155-S



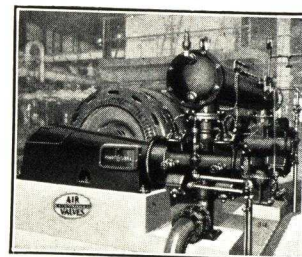
3-A Single-stage Compressor
Adapted for boosting steam to
higher pressures. Cat. 155-S



7-A Single-stage Vacuum Pump,
Short Belt Drive
Cat. 155-S

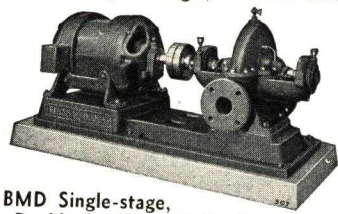


4-A Single Stage Compressor,
Steam Drive
Cat. 155-S

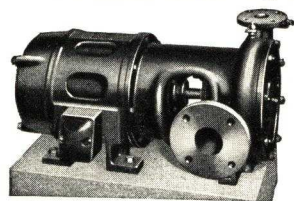


DE Duplex Compressor, Synchronous
Motor Drive
Cat. 151-S

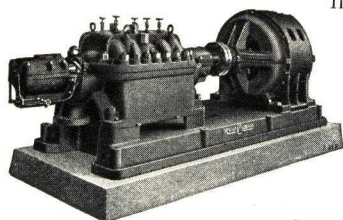
Single-stage, Double Suction Centrifugal Pumps



BMD Single-stage,
Double Suction Ball Bearing Pump



Penn-Motor Pump



OMS Five-stage Centrifugal Pump

Furnished for capacities up to 3000 g.p.m. against heads up to 300 ft., for medium and high speed service. Equipped with ball or sleeve bearings. Fitted with Chrome Nickel Alloy, Monel Metal and other special metals where conditions of service require.

Catalogs 214-S and 219-S.

Self-contained Single-stage Pumps

Furnished for capacities from 5 to 700 g.p.m. and for heads up to 250 ft. Pump and motor form complete, compact unit. Pump interior accessible without disturbing piping. *Catalog 218-S.*

Multi-stage Centrifugal Pumps

Furnished in both

bolts, nuts or screws. Unusual strength of parts. Bearings of generous proportions. Totally enclosed

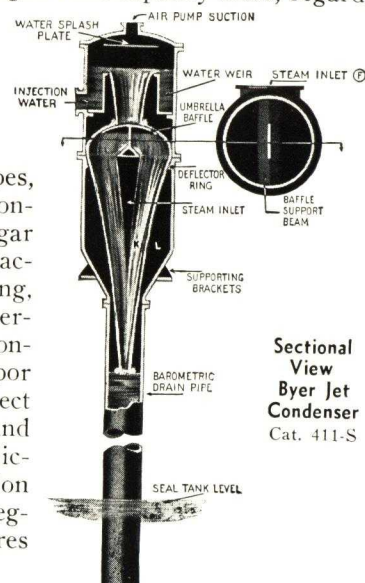
construction. Convenient accessibility. Improved methods of regulation and control.

Pennsylvania compressors are furnished for capacities from 30 to 3100 cu. ft. piston displacement and for pressures from 15 to 500 lbs. Special cylinder liners and valves, made from non-corrosive alloys, are supplied where conditions of service require.

sleeve and ball bearing types for capacities up to 1800 g.p.m. against heads up to 1800 ft. Hydraulic balance is accomplished by placing a properly proportioned distance bushing between the two directly opposed impellers. In this manner, positive balance is effected over practically the entire range of the capacity head, regardless of the number of stages. *Catalog 216-S.*

Condensers

Byer Jet Condensers are built as barometric and floor operated types, for all classes of steam condensing operation, sugar refining, chemical manufacturing, petroleum refining, food products, or any operation requiring the condensing of steam or vapor or cooling gases by direct contact between water and mixtures handled. Simplicity of internal construction with automatic vacuum regulation are salient features of design.



Sectional
View
Byer Jet
Condenser
Cat. 411-S

SCHRAMM, INC.

Manufacturers of Portable and Stationary Air Compressors and
Electric Welders

WEST CHESTER, PA.

BRANCH OFFICES

90 West Street
NEW YORK

709 Arch Street
PHILADELPHIA

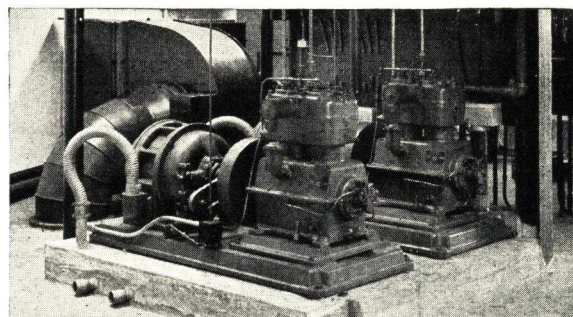
549 W. Washington Street
CHICAGO

75 Fremont Street
SAN FRANCISCO

Stationary Compressors

A complete assortment of belt and motor-driven compressors for shop installation include flat belt drive, "V" belt drive, direct motor drive, and complete outfits with tank, cooling system and mounting ready to receive motor.

The construction of SCHRAMM belt and motor driven compressors is identical with that used in the portable gasoline engine-driven units. These compressors are built in one, two and four cylinder vertical design, the general construction of each being similar. All are water-cooled single acting, single stage and suitable for 100 pounds maximum working pressure.

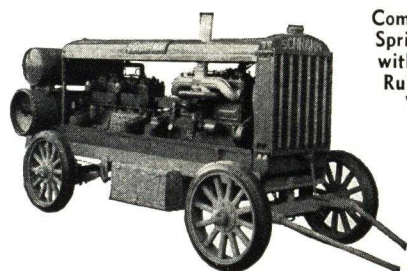


Two Direct Motor-driven Stationary Compressors

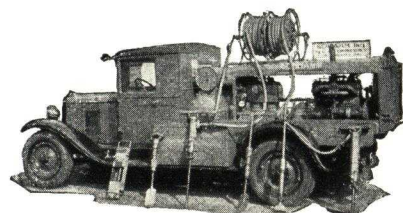
Portable Compressors

Portable gasoline engine-driven air compressors are manufactured in sizes—36, 72, 120, 180, 240, 360, 540 and 720 cu. ft. displacements, and recommend for maximum working pressure of 100 pounds.

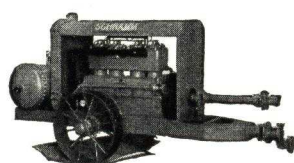
In building the complete line of portable engine-driven units, it has been our object to produce a machine unsurpassed in mechanical construction, simple in design, neat in appearance, entirely automatic in control, free from vibration, durable and highly efficient. There are fourteen types of mountings that will meet any requirement.



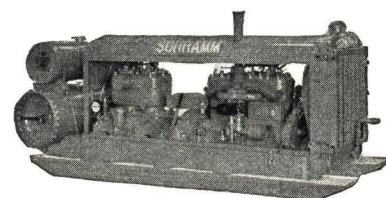
Compressor on
Spring Trailer
with Artillery
Rubber-tired
Wheels



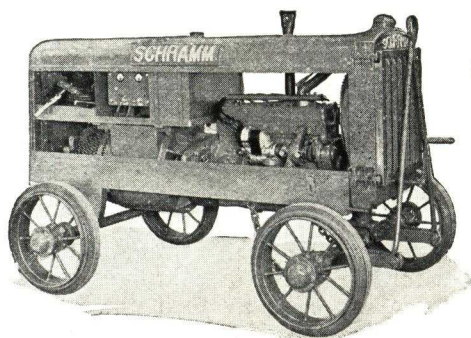
Motor Truck Mounted



For Coupling with Tractor
Power Take-off



On Wooden Skids

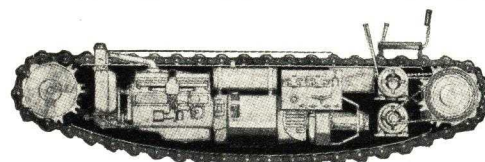


Schramm
Engine-driven
Welder

ments of railroads, pipeline, building and tank construction and miscellaneous repair work.

The most recent machine to be introduced by SCHRAMM, INC. is the "Trac-Welder," which is a self-propelled, crawler type unit capable of travelling rail-

Trac-Welder
for Railroad
Maintenance



road ties or the roughest ground. It is particularly designed for railroad track maintenance and pipeline construction.

Other types of mounting can be secured for any of the four sizes.

Portable engine-driven Electric Welders are built in four sizes—200, 300, 400 and 600 amperes—and are particularly adaptable for the severe welding require-

BUFFALO PUMPS, INC.

"Manufacturers of Better Pumps Since 1887"

484 Broadway, BUFFALO, N. Y.

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SEATTLE, WASH., 2719 First Avenue, South, A. T. Forsyth
ST. LOUIS, MO., 1596 Arcade Building, J. W. Cooper
TOLEDO, OHIO, 1817 No. 13th Street, C. M. Eyster
WASHINGTON, D. C., 403 Comm. Nat'l Bank Bldg., G. S. Frankel

COMPLETE LINE MANUFACTURED IN CANADIAN BRANCH BY
CANADA PUMPS, LIMITED, KITCHENER, ONTARIO

Products

A complete line of STEAM PUMPS, SINGLE and MULTI-STAGE CENTRIFUGAL PUMPS, POWER PUMPS and SPECIAL PUMPS for special purposes, etc.

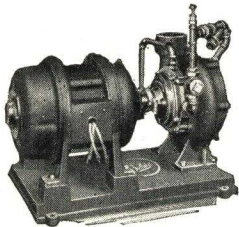
Descriptive literature furnished on request.

Buffalo Self-Priming Single and Double Suction Centrifugal Pumps

All Buffalo Single and Double Suction Centrifugal Pumps can now be had with positive self-priming device built with the pump. This primer is built under license from the Nash Engineering Company, and fully covered by patents. It is identical in design with the Nash primer, and is guaranteed to give absolute satisfaction.

Self-priming pumps have these advantages: (1) All working parts are above the liquid to be pumped. (2) There is complete access to all parts of installation. (3) Rotors are perfectly balanced—vibrationless. (4) As compared to vertical submerged pumps, Buffalo Self-Priming Pumps are very quiet—no long shafts to vibrate and fewer bearings. (5) Constant positive prime obtained without foot valves.

Buffalo Self-Priming Pumps are built in all types and capacities for every service on which centrifugal pumps can be used.

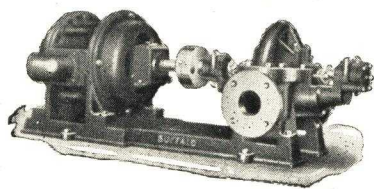


Other Buffalo Centrifugal Pumps

In addition to the self-priming types described above, there are complete lines of single and double suction centrifugals for use where primer is not required. Among these is the Type CC, a close-coupled single suction pump mounted on motor housing. This type is designed for built-in application and is unusually low in price. Complete information on these pumps on request.

Special Buffalo Centrifugal Pumps

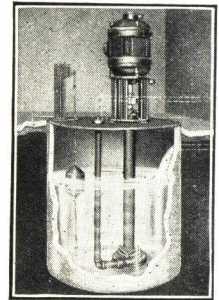
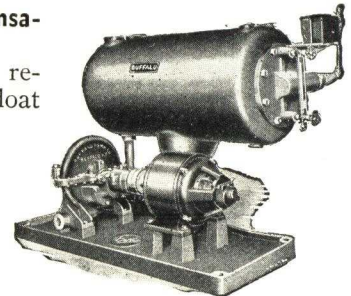
We manufacture heavy stock pumps for paper mills, process plants, etc., as well as acid pumps made of special acid resisting metals, and pumps for handling very hot liquids.



Be sure to get our recommendations before buying pumps for any special service.

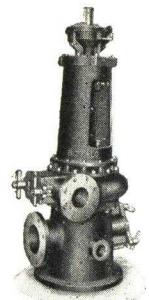
Buffalo Centrifugal Condensation Outfits

Consists of pump and receiver with automatic float switch and strainer. They handle condensate at 212° F. without being affected in any way, and give the same efficient service regardless of temperature of water. Due to this effective handling of very hot water, these pumps operate with low thermal losses. Cast iron receiver, copper ball float. Self-contained. Entirely automatic. Also made with steam pump.



Buffalo Sump Pumps

"Buffalo" Sump or Bilge Pumps are entirely self-contained and automatic in operation. Equipped with large ball thrust bearings, with automatic lubrication. Shaft entirely enclosed. Stuffing box and gland at cover plate prevent foul odors rising into room.



Buffalo Raw Sewage Pumps

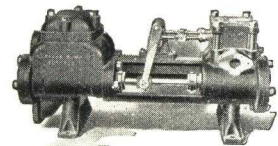
Made in five sizes, can be furnished in both vertical and horizontal types.

They are guaranteed to handle solids up to definite sizes, and will handle rags, pieces of clothing, sticks and other material and are absolutely non-clogging.

Buffalo Steam Pumps

"Buffalo" Piston Packed Steam Pumps are suitable for boiler feeding and general service for pressures up to 200 lb.

Handle hot or cold water.



Buffalo Underwriter Foot Valves

Built in strict accordance with specifications of the Underwriters and are approved by them. They are suitable for use with either centrifugal or reciprocating pumps. Strainers not furnished as standard equipment, but can be supplied on special order. Have extra large valve areas, and are built for pressures up to 125 lbs. Sizes from 6 to 24 in.

DAYTON-DOWD COMPANY

Manufacturers of Centrifugal Pumps

QUINCY, ILL.

OFFICES IN FIFTY-ONE CITIES



Products

TYPE CSLH, DOUBLE-SUCTION LOW PRESSURE PUMPS (Bul. 267).

TYPE CSLH, DOUBLE-SUCTION HIGH PRESSURE PUMPS (Bul. 267).

TYPE "A," DOUBLE-SUCTION BALL BEARING PUMPS (Bul. 269).

TYPE CSD, MULTI-STAGE PUMPS—automatically balanced (Bul. 300).

TYPE TU, TWO-STAGE OPPOSED IMPELLER PUMPS (Bul. 301).

TYPE CSF, SINGLE-STAGE, APPROVED UNDERWRITERS' FIRE PUMPS (Bul. 500).

TYPE CSB, APPROVED UNDERWRITERS' BOOSTER PUMPS (Bul. 500).

TYPE CSDF, MULTI-STAGE APPROVED UNDERWRITERS' FIRE PUMPS (Bul. 500).

TYPE CST, TANK FILLING PUMPS (Bul. 600).

TYPE SB, SINGLE SIDE-SUCTION GENERAL SERVICE PUMPS (Bul. 700).

TYPE NH, SMALL MOTOR DRIVEN PUMPS (Bul. 800).

TYPE HR, AUTOMATIC CONDENSATE PUMPS and RECEIVERS (Bul. 900).

TYPE SV, SEWAGE EJECTORS (Bul. 1100).

TYPE CV, NON-CLOGGING SEWAGE PUMPS—vertical and horizontal (Bul. 1201).

Scope of Application

Dayton-Dowd centrifugal pumps are built in a wide range of sizes, from $\frac{3}{4}$ -in. discharge up to and including 48-in. discharge, for practically any pressure. They are built in cast iron, cast steel and bronze alloys to meet any operating conditions.

Dayton-Dowd pumps are in use for general water supply, boiler feed, water works and filtration plants, sewage, pumping stations, house pumping service, heating pumps, elevator pumps, automatic condensation return pumps, Underwriter approved centrifugal fire pumps, booster pumps, tank filling pumps, sugarhouse pumps for all services, chemical pumps, filter press pumps, mine pumps, condenser pumps, oil refinery pumps for handling oils, gasoline, distillate, etc., ice and refrigeration system pumps, paper mill pumps, drainage and irrigation pumps, and many other services.

Engineering Service

DAYTON-DOWD COMPANY is an organization of centrifugal pump specialists. They manufacture no other type of pumps but centrifugal and, through an experience extending over many years, have accumulated a wealth of information with reference to pumping problems which is at the disposal of pump users everywhere.

Our engineers at the Home Office and in fifty-one district offices who are trained in the application of centrifugal pumps, will be glad to have you consult with them concerning specific pumping problems.

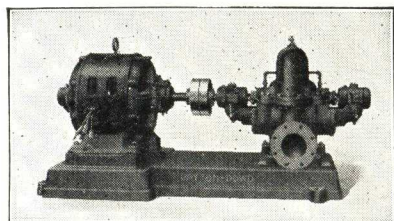


Fig. 307. Type CS Single-stage Double-suction Bronze Fitted Split Case Motor Driven Pump

Built in sizes from $1\frac{1}{4}$ to 48-in. discharge for pressures up to 240 ft.

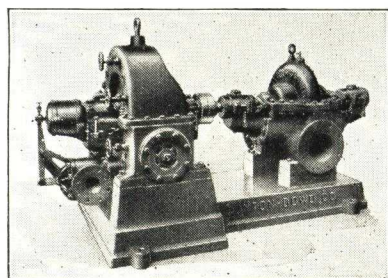


Fig. 123. Type CS Single-stage Double-suction Bronze Fitted Split Case Pump Driven by Direct Connected Steam Turbine

Built in any size and for high speeds and high pressures

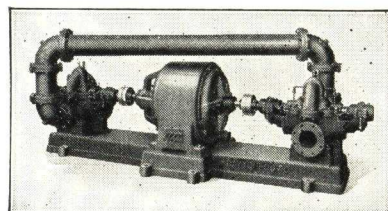


Fig. 293. Type CS Single-stage Double-suction Bronze Fitted Pumps Connected in Series with Motor Mounted Between Pumps

Especially efficient at motor speeds for high pressure service

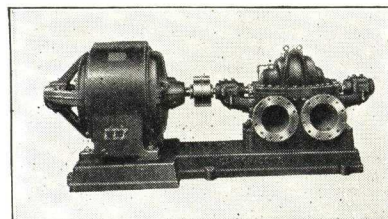


Fig. 341. Type CSD Multi-stage Automatically Balanced Bronze Fitted Motor Driven Pump for High Pressure Service

This type may be furnished in any number of stages from 2 to 5 for very high pressures

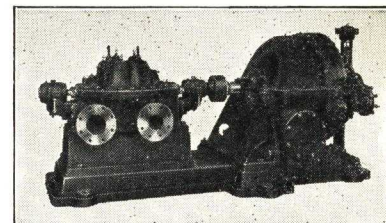


Fig. 405. Type CSD Multi-stage Automatically Balanced Bronze Fitted Turbine Driven Pump for High Pressure Service

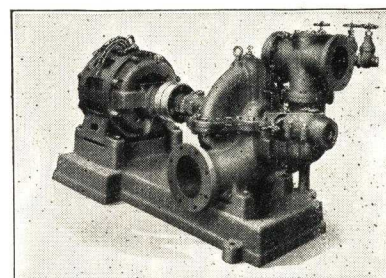


Fig. 303. Type CSF Single-stage Approved Underwriters' Centrifugal Fire Pump Driven by Electric Motor

Built in sizes 500, 750, 1000 and 1500 gal. for both motor and steam turbine drive

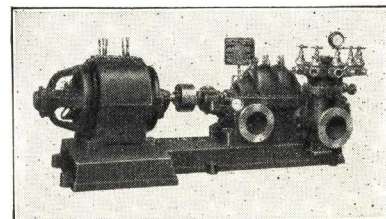


Fig. 444. Type CSDF Multi-stage Approved Underwriters' Centrifugal Fire Pump Driven by Electric Motor

May be supplied also for steam turbine or gas engine drive. Built in sizes 500, 750, 1000 and 1500 gal. for any pressure required for this service

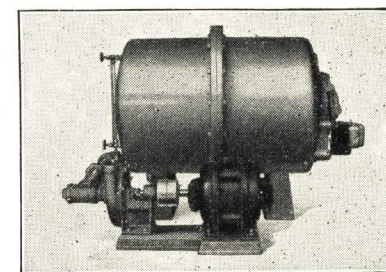


Fig. 379. Type HR Automatic Condensate Return Pump and Receiver

Built in a wide range of sizes and pressures

THE DEMING COMPANY

Manufacturers of Hand and Power Pumps for All Uses

SALEM, OHIO

Deming Deep Well Turbine Pumps

Water Lubricated



Fig. 4700

Deming Turbine Pumps meet the requirements of laundries, factories, municipal water works, golf courses, creameries—wherever a plentiful supply of water is needed—also used for mines and mine sinking pumps.

Water lubrication, Goodrich Cutless Rubber Bearings, adjustable semi-open type impellers and many other exclusive features make the Deming Turbine an outstanding pump in this field.

Deming Turbines are dependable and will give year after year of satisfactory service at minimum upkeep expense.

Turbine Bulletin contains complete information.

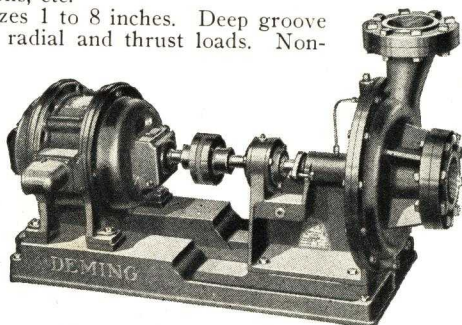
Deming-Mueller Side Suction Centrifugal Pumps

Ball Bearing

Can be used efficiently not only for general water supply, low or high heads, but the non-clogging feature of the impeller makes them ideal for handling screened sewage, mash, paper stock, molasses, starch, crude oil, unwatering building excavations, etc.

Furnished in sizes 1 to 8 inches. Deep groove ball bearings for radial and thrust loads. Non-clogging open type impeller gives exceptionally high efficiencies. Inside bearing is a bronze bushing of the oilless type insuring long life.

Bulletin No. 4001 contains complete data including performance tables.

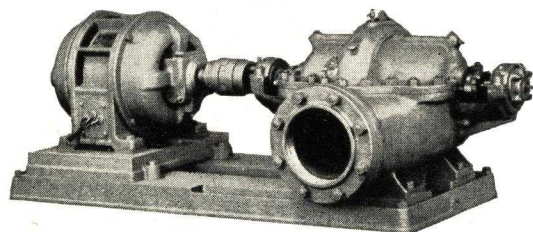


Figs. 4010, 4020, 4030 and 4040

Deming-Mueller Double Suction Centrifugal Pumps

Ball Bearing

General service pumps recommended for working pressures up to 200 lbs. Rotating elements are in perfect static and dynamic balance.



Figs. 5010, 5020 and 5030

Furnished in sizes 3 to 10 inches. Double-row, combined radial and thrust ball bearings. Enclosed type impeller with removable wearing rings for both casing and impeller.

Bulletin No. 5001 contains complete data.

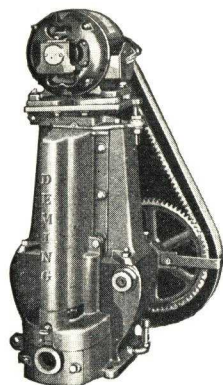


Fig. 1062

Deming "Oil-Rite" Deep Well Pumps

For use when the water is at a greater depth than 25 feet.

Suitable for use with single-acting or double-acting cylinders. Furnished with air compressor when used for hydro-pneumatic service. Rated for moderate plunger loads.

Helical cut gears, automatic and force feed lubrication. Exceptionally large bearing areas.

Made in four sizes: 6, 10, 14 and 18-in. stroke. Can be equipped with either silent chain or multiple "V" belt drive.

See Catalogue "A" for complete description.

Deming "Oil-Rite" Shallow Well Pumps

For vertical suction lift of 25 feet or less

Double-acting, automatic oiling, helical gearing. Timken roller bearings, accessible water end. Built in sizes ranging from 10 to 80 g.p.m. Suitable for working pressures up to 100 lbs.

Furnished with silent chain or multiple "V" belt drive.

See Catalogue "A" for complete description.

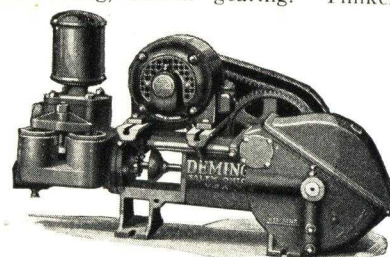
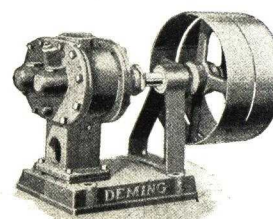


Fig. 1809

Deming Rotary Force Pumps

Designed for pumping petroleum products, oil burner service, handling food products, paint and varnish and numerous other services. Built of either iron or bronze. Can be furnished with belt or motor drive.

See Bulletin No. 1500 for complete description.



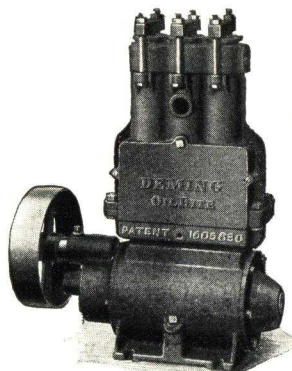
Rotary Force Pump

Deming Vertical "Oil-Rite" Piston Pumps

Single Acting. For pressures up to 300 lbs.

A complete line of Duplex, Triplex and Quadruplex pumps. Suitable for an unlimited variety of uses. Adaptable for practically every high pressure service within their limits of capacities and pressures. Stuffing boxes are not subjected to high pressure but pack against suction only.

See Bulletin No. 99 for complete description.



Vertical "Oil-Rite" Piston Pump

ECONOMY PUMPING MACHINERY CO.

GENERAL OFFICE
3431 West 48th Place, CHICAGO, ILL.

REPRESENTATIVES

AMARILLO, TEX., B. Greve, 1308 Hillcrest Street
ATLANTA, GA., Perry Guest, 1230 Virginia Avenue, N. E.
BALTIMORE, MD., W. I. Collier & Co., 522 Park Avenue
BIRMINGHAM, ALA., James L. McVoy, Brown Marx Building
BOSTON, MASS., Emerson, Swan, Goodyer Co., 110 Arlington Street
CLEVELAND, OHIO, Geo. T. Hill, 2622 No. Moreland Boulevard
COLUMBUS, OHIO, Jordan Equipment Co., 83 So. High Street
DETROIT, MICH., Frank H. Patterson, 9201 Boleyn Street
HARTFORD, CONN., Earl Sexton, 647 Main Street
HOUSTON, TEX., Southern Engine & Pump Co., 900 St. Charles Street
INDIANAPOLIS, IND., Indiana Scale & Equipment Co., 139 W. 16th Street
KANSAS CITY, MO., The Ritts Co., 609 Linwood Boulevard
MEMPHIS, TENN., Power Equipment Co., 1348 Madison Avenue
MILWAUKEE, WIS., C. A. Ekstrom Co., 2540 W. Wells Street
NASHVILLE, TENN., W. C. Armistead, 207 Ninth Avenue, North

NEW ORLEANS, LA., E. W. Carr, Inc., 807 Howard Avenue
NEW YORK, N. Y., Quimby-Ryan Engineering Sales Co., 1 E. 42nd Street
OKLAHOMA CITY, OKLA., Frank Loeffler Supply Co., 710 No. Hudson Street
PHILADELPHIA, PA., Haynes Selling Co., Inc., 1518 Fairmount Avenue
PHOENIX, ARIZ., O. H. Benner, 606 Washington Street
PITTSBURGH, PA., Jas. McB. Hezlep, 63 Vincennes Avenue (Oakdale, Pa.)
PLYMOUTH, MICH., Scully Sales Co., 713 Ann Street
ROCHESTER, N. Y., John J. McFarlin, 54 Macbeth Street
ST. LOUIS, MO., Midwest Heating & Ventilating Equipment Co., 1901 Washington Avenue
SAN FRANCISCO, CAL., J. Harry Russell, Monadnock Building
SCRANTON, PA., John P. Gilboy, P. O. Box 214
SYRACUSE, N. Y., H. K. Ormsby, Jr., Yates Hotel Building
WISCONSIN RAPIDS, WIS., Badger Sales Co., Mead-Witter Building

Products

CENTRIFUGAL PUMPS FOR CLEAR LIQUIDS—Capacities, 0-3000 g.p.m. at 200-ft. head; 0-7500 g.p.m. at 100-ft. head; and 0-400 g.p.m. at 1000-ft. head: Horizontal and vertical designs for various types of drives.

NON-CLOGGING CENTRIFUGAL PUMPS—For liquids containing a large percentage of solids or pulpy matter. Horizontal and vertical. Sizes, 2 to 18 in. Capacities, 100 to 20,000 g.p.m., with ability to handle solids $2\frac{1}{4}$ to 12 in. in diameter.

SUMP PUMPS—Automatic for drainage of all kinds.

SINKING PUMPS.

AXIAL FLOW PUMPS—Horizontal and vertical. Capacities, 150 to 30,000 g.p.m. against low heads.

CONDENSATION PUMPS AND RECEIVERS.

RETURN LINE VACUUM PUMPS.

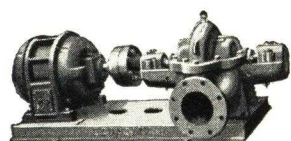
Also Sewage Pumps (capacities, 100 to 20,000 g.p.m.); Boiler Feed Pumps (capacities, 10 to 400 g.p.m.; pressures, to 400 lbs.); Special Pumps for Resale Manufacturers (Single, Tandem, Triple and Quadruple Centrifugal Pumps for all kinds of special services); Pumps for Heating Systems (return line vacuum pumps, condensation pumps, etc.).

Pumps for Clear Liquids

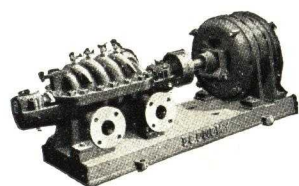
These pumps are suitable for general water supply for buildings, power plants, railroads, and in connection with industrial processes; for pumping all kinds of clear liquids in paper mills, mines and quarries, food industries, cane sugar refineries, chemical processes (acid pumping) and for many other similar applications.

They are equipped with enclosed impellers for handling water, brine, oil, acids, etc. Bronze impellers and fittings are standard. Monel metal, stainless steel, Everdur and other alloys furnished on special order.

The sturdy mechanical design and high efficiency of these pumps make them particularly suitable for mill and power plant service. Precision methods in manufacturing and careful testing of each unit insures satisfactory performance. Complete sizes and details of construction are given in Bulletins Nos. 408, 414, 415, 416 and 424.



Single Stage, Double Suction Pump

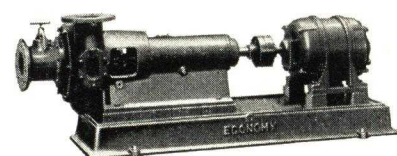


Multi-Stage Pump

Non-Clogging Centrifugal Pumps

Capacities, up to 20,000 g.p.m. Heads up to 150 ft. These pumps are made in both horizontal and vertical types. They are used for pumping raw sewage, industrial waste, paper pulp, etc., in sewage lift stations and in place of conveyors in industrial plants.

In addition to the pumps illustrated we are



Horizontal Non-Clogging Pump

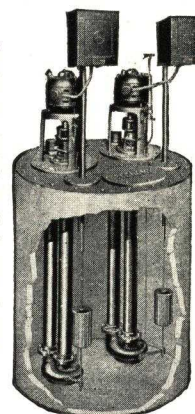
in position to furnish complete sewage and process pumping equipment, consisting of tanks, valves, fittings, piping, electric motors, automatic control, etc., all factory assembled and ready for testing.

Our Engineering Department will be pleased to submit layout sketches of such equipment.

Complete specifications and details of construction are contained in Bulletin No. 413.

Sump Pumps

Capacities, up to 5,000 g.p.m. Heads, up to 120 ft. Economy Sump Pumps and Sewage Ejectors are made in both clear water and non-clogging design. The non-clogging pumps handle sewage, rags, stones, etc., which are encountered in unscreened drainage. A number of interesting improvements have been made in these pumps to lengthen life and reduce maintenance cost. These features, together with complete capacity tables, are contained in Bulletin No. 407 for clear seepage design, and Bulletin No. 427 for the non-clogging design. The illustration shows a duplex pump. Single pumps are of the same design but mounted one in a basin.



Duplex Sump Pump

Sinking Pumps

Capacities, up to 1000 g.p.m. Heads, up to 300 ft. Designed for use in construction work wherever shafts must be sunk through wet soils or gravel. They will pass pebbles and similar materials without breakage. Their shape is such that they fit between narrow ledges and into shafts of small diameter. The fact that Economy Sinking Pumps have been used, to the exclusion of all others, on many of the country's greatest construction projects, indicates the excellence of their design.

Axial Flow Pumps

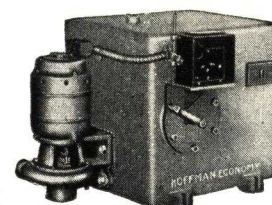
Capacities, up to 30,000 g.p.m. at low heads. These pumps meet the need of efficient low-priced apparatus for handling large volumes of water at low heads. They are used for drainage and sewage pumping, agitator service, irrigation, etc. They are designed for either horizontal or vertical settings for drive by electric motors, gasoline or oil engines, water turbines, etc. The simplicity of these pumps makes them ideal for many installations. They consist merely of an axial flow runner operating in a casing which also acts as suction and discharge pipe.

Send for layouts illustrating various types of settings.

Condensation Pumps and Receivers

Pumps and receivers are widely used to collect condensate, gland water drip, etc., and return it to the boiler or supply tank. The use of an electric pump and receiver instead of a steam pump makes it possible to reduce steam pressure during the night or inoperative period.

Complete description and list of sizes, both single and duplex, are given in Bulletin No. 423.

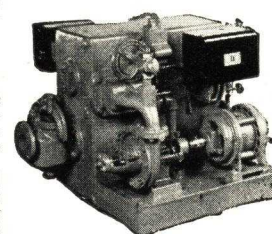


Condensation Pump and Receiver

Return Line Vacuum Pumps

These pumps are used to accelerate steam circulation on low pressure heating systems. They provide for rapid removal of air from the system and insure the return of condensate to the boiler.

The Jet Type Vacuum Producer used in this pump is based on the simplest and best known method for exhausting air and vapors. The units are built in both single and duplex types, descriptions of which are given in Bulletin No. 422.



Return Line Vacuum Pump

GOULDS PUMPS, INCORPORATED

Manufacturers of Pumps for Every Service
Hydroil Oil Purifiers

MAIN OFFICE AND FACTORY
SENECA FALLS, N. Y.

NEW YORK, N. Y.
BOSTON, MASS.
HOUSTON, TEX.

BRANCHES
CHICAGO, ILL.
PITTSBURGH, PA.

PHILADELPHIA, PA.
ATLANTA, GA.
TULSA, OKLA.

REPRESENTATIVES IN ALL OTHER PRINCIPAL CITIES

Products and Service

Single-acting and double-acting piston and plunger pumps; single-stage and multi-stage centrifugal pumps; sump pumps; Underwriters' fire pumps; rotary pumps, shallow and deep well water systems; hand and force pumps, Goulds-Wagener Steam Pumps; also Hydroil Oil Purifiers.

Goulds are one of the world's largest makers of pumps. This position has been reached by sound engineering practice and adherence to quality standards. An extensive laboratory is maintained for the study of pumping problems and the continuous improvement of the line. This research insures the better performance of Goulds Pumps.

Goulds also manufacture a complete line of oil purifiers. Hydroil Purifiers for the purification of fuel, lubricating, turbine and insulating oils of all types, have been accepted as standard in industry for years.

A nation-wide organization, consisting of branch houses, distributing houses, and factory representatives, makes available stock for quick shipment and expert advice on your pumping and purifying problems.

The field force has at its disposal constantly the effective co-operation of the factory engineering department.

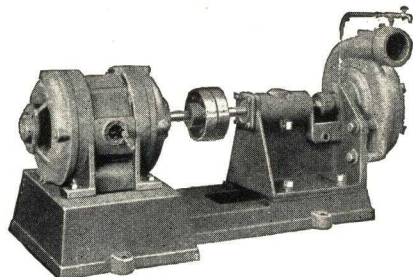


Fig. 3158 Double Bearing Flexi-Unit

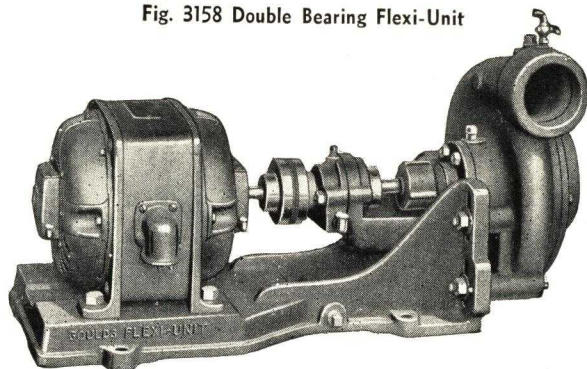


Fig. 3057 Single Bearing Flexi-Unit

Flexi-Unit Pumps—Figs. 3057-58, 3357-58, 3157-58, 3307-08 and 3159

One and two-stage, open impeller centrifugal pumps, with a range of capacities and a flexibility which make them adaptable to a wide variety of services. Furnished with single or double ball bearing shaft drive mountings. Bedplates will mount motors from 1/4 to 50 hp. Sizes 1 to 8 ins. Capacities 10 to 4500 gallons per minute. Heads up to 350 feet. Individually engineered. Interchangeable parts. Immediate shipments made from local stocks.

Single-stage Centrifugals—Fig. 3065-3095

Four groups of pumps: Fig. 3065, 3075, 3085 and 3095 for low, medium low, medium high, and high heads. Eighteen pumps in all, built in sizes from 2 in. to 12 in. with a capacity range of from 40 to 7300 g.p.m., for heads up to 300 ft.

Adapted for belt, motor, turbine or gasoline engine drive, for speeds up to 2850 r.p.m.

Four constructions: Standard fitted, bronze fitted, with bronze impeller and shaft sleeves; all bronze, with monel metal shaft; and all iron. Write for Bulletin 200.

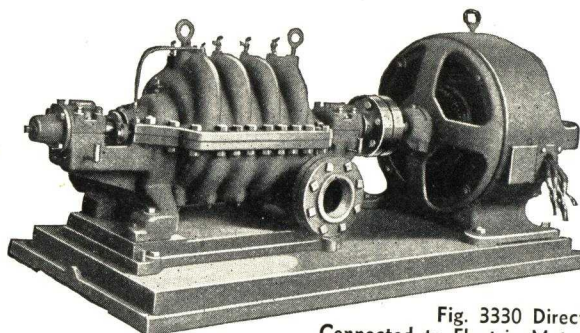


Fig. 3330 Direct Connected to Electric Motor

Multi-stage Centrifugal Pump—Fig. 3330

A multi-stage, enclosed impeller pump for general water supply, pressure service, circulating systems, unwatering and many other uses. Bronze fitted, all iron, and all bronze constructions. Built in sizes from 3 in. to 8 in., from 4 to 6 stages. Capacities 40 to 2000 g.p.m. Heads up to 850 ft., or 370 lbs. pressure. Write for Bulletin 201.

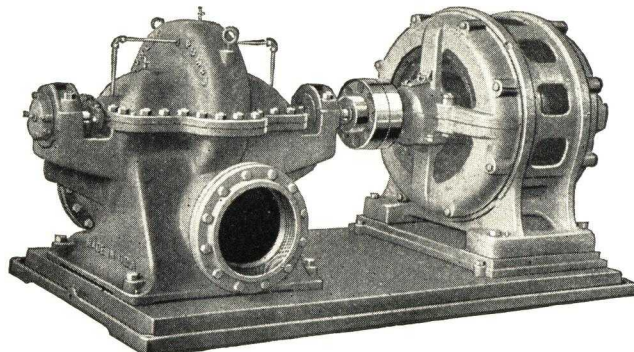


Fig. 3450 Direct Connected to Electric Motor

Single-stage Centrifugal Pump—Fig. 3450

A large capacity, single-stage, double-suction centrifugal pump, built in 2, 2 1/2, 3, 4, 6, 14 and 16-in. sizes. For general water supply, municipal waterworks, circulating and booster service and low pressure boiler feeding. Ball bearing type, with oil or grease lubrication. For motor, steam turbine or gasoline engine drive. Capacities up to 15,000 g.p.m. Heads up to 250 ft. Write for Bulletin 200.

Goulds New Sump Pump—Fig. 3047—Vertical Type

A large size, submerged type sump pump, built in single and duplex units for pit depths from 3 to 14 ft. The new, non-clogging, high efficiency impeller will pass water containing coarse, stringy or fibrous materials, and will permit the use of motors, one or two sizes smaller than are generally used on a pump of this type. Made in four sizes to handle from 20 to 650 g.p.m., for heads up to 70 ft. Motor and float switch are mounted on steel pit cover. Covers of 40-in. diameter, 36-in. square, or larger rectangular type will include an 11x15-in. manhole with cover. Pump and motor unit can be removed without disturbing the pit cover. Also furnished in Duplex outfits—Fig. 3048.

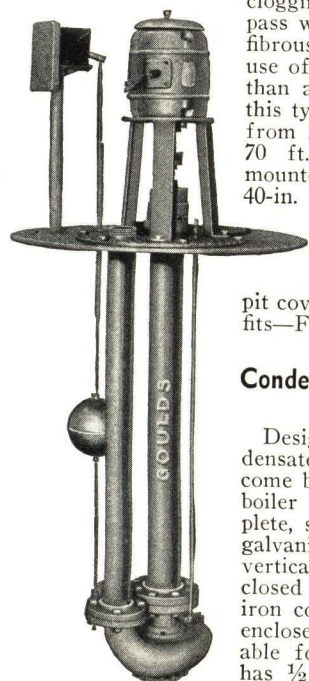


Fig. 3220 Horizontal Type—These are built in sizes for radiation from 2000 to 40,000 sq. ft., for various pressures. The pump used is specially built for hot water and is self-venting to prevent vapor binding. Rust resisting tanks are used. Motors of any current characteristics can be furnished.

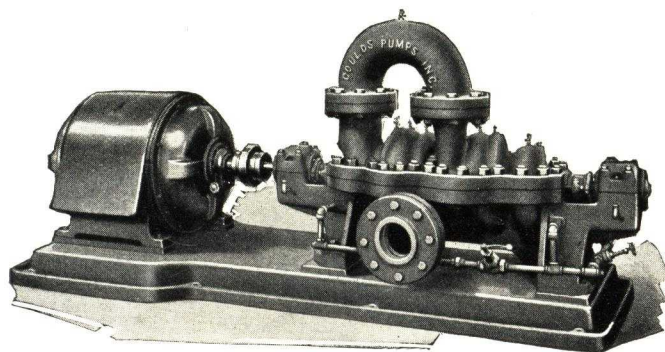


Fig. 3360

High Pressure Multi-stage Centrifugal—Fig. 3360

Built especially for boiler feeding, oil pipe line or refinery service, hydraulic pressure service and other general use where high pressures are required. Built in two sizes, 4 and 6-in. Capacity range, 50 to 1200 g.p.m. Heads up to 1500 ft. or 650 lbs. pressure.

Motor and Belt Driven Small Centrifugals—Fig. 3004, 3005, 3010, 3012, 3028 and 3038

These pumps have a wide range of uses including hot and cold water circulating, general water supply, booster service, handling brine, alcohol, cutting oils, compound and many other liquids.

Fig. 3005 and 3010 are belt driven, with a capacity range from 20 to 1300 g.p.m. and heads up to 100 ft.

Fig. 3004 and 3012 are direct motor connected, with capacities up to 130 g.p.m. and heads up to 60 ft.

Fig. 3028 is a small ½-in. pump direct connected to a ¼ hp. motor. Capacities 4 to 10 g.p.m. Heads up to 10 ft.

Fig. 3038 is an improved centrifugal pump. Two sizes, ¾ in. and 1¼ in. Capacities 5 to 40 g.p.m. Heads up to 20 ft. New open impeller will pass solids up to ½ in.

11

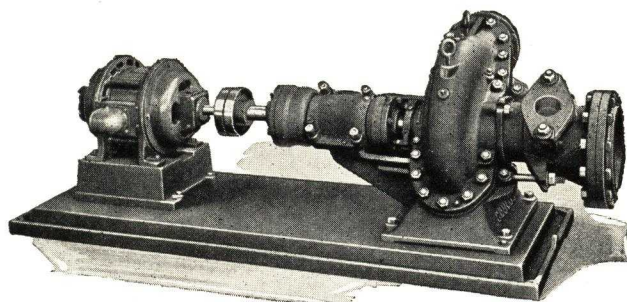


Fig. 3105 Direct Connected to Electric Motor

Centrifugal Pump for Thick Liquids—Fig. 3105

Designed primarily for the paper industry handling ground wood, sulphite soda, kraft and rag stock up to 5½ per cent consistency. Will also handle other thick liquids. Has two-vane, open type, non-clogging impeller.

Built in 4, 6 and 8-in. sizes; for capacities up to 3500 g.p.m. Heads up to 180 ft. Write for Bulletin 206.

Underwriters' Fire Pump—Fig. 3099, No. 6

A centrifugal pump built to specifications of the National Fire Protection Association and listed as standard by the Underwriters' Laboratories, Inc., and the Associated Factory Mutual Fire Insurance Companies. Enclosed type impellers, double suction. 8-in. suction and discharge.

Capacities up to 1000 g.p.m. Heads up to 100 lbs. Will handle up to four nozzles. For this, and other fire pumps, write for Bulletin 2579-J.

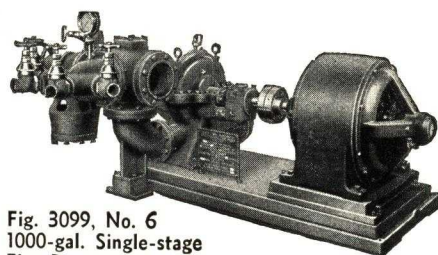


Fig. 3099, No. 6
1000-gal. Single-stage
Fire Pump

Triplex Plunger Pumps

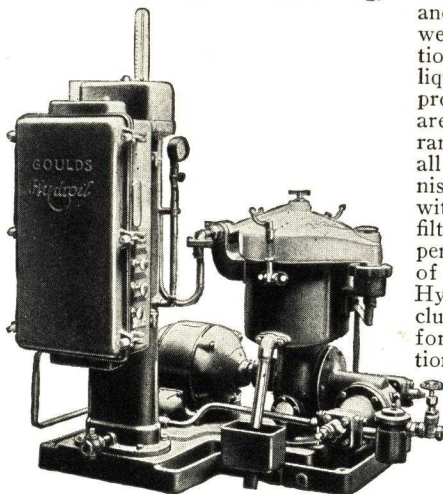
Single-acting plunger type. For general water supply, municipal waterworks, boiler feeding, mine pumping, irrigation and other uses. Many of these pumps have been giving satisfactory service for twenty and thirty years.

Built in capacities from 2 to 625 g.p.m. For working pressures up to 7500 lbs.

Hydroil Oil Purifiers

Goulds Hydroil Centrifugal Purifiers are recommended for the purification of all lubricating, turbine, fuel, insulating

and industrial oils; as well as the purification or clarification of liquids in industrial process work. Units are built in a complete range of sizes to meet all requirements. Furnished either with or without heater units or filter attachments, depending on the nature of the work. Goulds Hydroils have many exclusive features. Write for complete information.



Goulds Hydroil
Purifier with
Heater Unit

KINNEY MANUFACTURING CO.

3529 Washington Street, BOSTON, MASS.

BRANCH OFFICES

NEW YORK, N. Y., 30 Church Street
KANSAS CITY, MO., 407 Finance Building

CHICAGO, ILL., 1202 Buckingham Building

PHILADELPHIA, PA., 725 Commercial Trust Building
LOS ANGELES, CAL., 1333 Santa Fe Avenue

Products

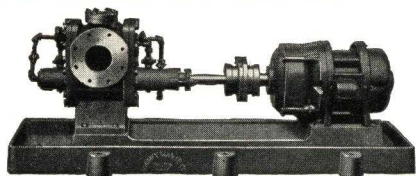
ROTATING PLUNGER and HELIQUAD PUMPS, Plain pattern and Steam Jacketed; HIGH VACUUM PUMPS; FRICTION CLUTCHES and CUT OFF COUPLINGS; STRAINERS; BITUMINOUS DISTRIBUTORS for Road Building.

Type SD Rotating Plunger Pumps

(Write for Bulletins 1 and 2)

A simple, positive pump with few working parts, known and favored for its performance records on lubricating oil, fuel oil, asphalt, emulsions, tar, molasses, silicate of soda, white lead and similar difficult pumping services.

The high volumetric and mechanical efficiency of these pumps is coupled with an almost unbelievable record of low maintenance costs. Each pump is capable of producing vacuums within 1 in. of barometer on a closed system.



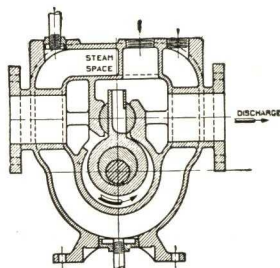
Kinney Gear Motor Driven High Pressure Unit
Type SD

Capacities—1 to 3000 g.p.m. up to 150 lbs. pressure: 1 to 145 g.p.m. to 300 lbs. on fuel and lubrication oils and similar service. Special pumps made for higher pressures.

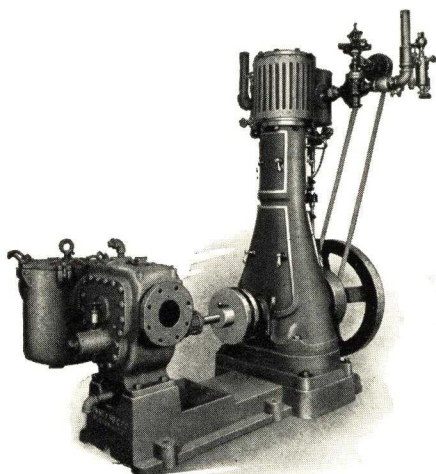
Plain pattern Type SD Pumps are used for pumping light and volatile liquids. Steam jacketed pumps are designed for pumping heavy viscous materials which can be economically pumped only when the pump itself can be thoroughly heated.

Suction Strainers

Basket type. Sizes, 2 to 16 ins., plain or steam jacketed. Bodies suitable for 100 lbs. pressure. Steel strainers for higher pressures.



Jacketed Type SD Kinney
Rotating Plunger Pump



Kinney Steam Engine Driven Steam Jacketed Pumping Unit

Vacuum Pumps

(Write for Bulletin 3)

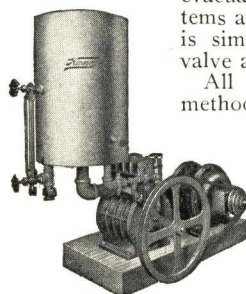
These pumps are used extensively for lamp and vacuum tube evacuation, vacuum dryers, impregnation systems and distillation systems. The pump itself is similar to the Type SD with a discharge valve added.

All parts are sealed with oil by a unique method which admits only sufficient oil to seal and lubricate; all oil discharged at each revolution of pump without churning or excessive heat losses.

These pumps are capable of producing absolute vacuum pressure of .01 mm. or better as indicated by a McLeod gauge.

Sizes—10 to 780 cu. ft. displacement.

Pumps show a high mechanical efficiency.

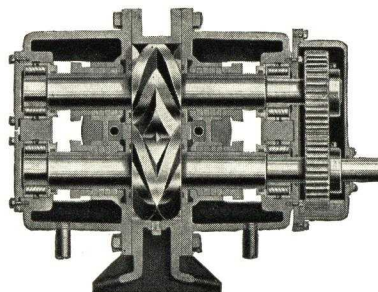


Kinney Vacuum Pump and
Separator

Heliquad Pumps

(Write for Bulletins HQ and HQ-B)

Type A-HQ is made for pumping liquids ranging from gasoline to molasses at pressures up to 200 lbs. Made in cast iron, cast steel or bronze with plain or steam jacketed cylinders; heads are plain, steam jacketed, or water cooled; external roller bearings and timing gears. Capacities from 20 to 2000 g.p.m.

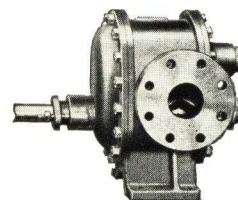


Internal Design of Kinney Heliquad Pump
Type A

Heliquad Type A Hot Oil Pump is suitable for temperatures up to 725 degrees and is especially desirable for refinery work where pulsation is to be avoided and where high temperature or high viscosities are encountered and high efficiency and low upkeep is desired.

Type B-HQ Heliquad Pump is similar to the Type A, with only one stuffing box and bearings lubricated by liquid handled. It is suitable for fuel oil, lubricating oil, and hot oil heating systems.

Capacities—10 to 600 g.p.m. Pressures from 50 lbs. to 250 lbs. depending upon size and duty. Higher pressures on application.



Type B Heliquad Pump

Write for Complete Information and Prices

Kinney Pumps are successfully handling the difficult pumping requirements of many industries. Kinney Engineers know pumping theory and practice and will co-operate with you gladly in the solution of all your pumping problems.

Complete descriptive bulletins of all Kinney products are available for your files.

LAWRENCE PUMP AND ENGINE CO.

Lawrence "Vortex" Centrifugal Pumps

P. O. Box 70, LAWRENCE, MASS.

NEW YORK OFFICE: 90 West Street

REPRESENTATIVES IN PRINCIPAL CITIES

Products

PUMPING UNITS for practically every purpose: Single Stage and Multi-stage; Horizontal and Vertical Shaft Type, and special pumps for special requirements; Built in Cast Iron, Cast Steel, Bronze, Monel Metal, Everdur, Stainless Steel, Aluminum or other special alloys to meet conditions.

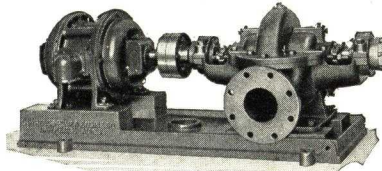
Lawrence "VORTEX" pumps are widely used for service in: Industrial plants, waterworks and filtration plants, power plants, sewage pumping stations, process industries, public buildings and hospitals, paper mills, mine and quarry; drainage and irrigation, oil industry, air conditioning apparatus and for many other applications.

Single Stage, Double Suction Pumps

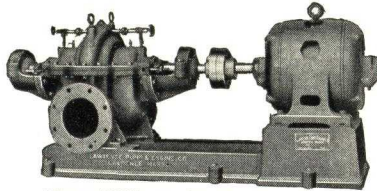
The type "HL" and "SS" are widely used for general service. Built in sizes from 1½ in. to 16 in. discharge for head conditions up to 300 ft., and higher heads in some of the smaller sizes.

These units are of the single stage, double suction type with horizontally divided casing and bearing yokes. Standard pumps bronze fitted. Double suction impellers hydraulically and mechanically balanced equalizes end thrust. Unsurpassed for economical operation, dependability and low maintenance cost.

Furnished for motor, turbine, gasoline engine, or belt drive.



Type "HL" Double Suction Pump



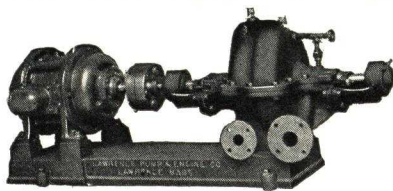
Type "SS" Double Suction Pump

Multi-stage Pumps

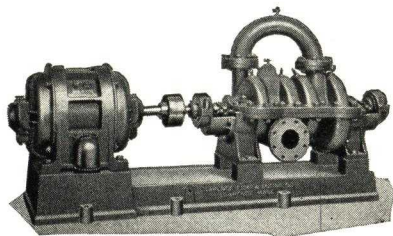
Type "MBS" Multi-stage Hydraulically Balanced Centrifugal Pumps are built in 2, 4 and 6 stages for high pressures. Especially used for modern boiler feed service and high pressure water supply, etc.

The impellers are opposed, resulting in an hydraulically balanced unit. Horizontal divided casing. Standard pumps, bronze fitted, equipped with ball bearings or ring oiling bearings. Incorporated in these pumps is the best of modern and hydraulic design, rugged construction, ready accessibility, and high efficiency resulting in low cost operation and maintenance.

Arranged for direct connection to electric motor or steam turbine.



Type "MBS" Pump with Opposed Impellers

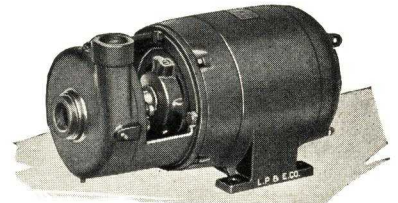


Type "MBS" Four-stage Pump, Motor Driven

Type "E" Electropump

A close-coupled, compact, efficient and low cost pumping unit for small and moderate capacities for operation against heads up to 150 ft. or 65 lbs. pressure in a single stage unit, and twice the head or pressure when furnished with two-stage unit in series.

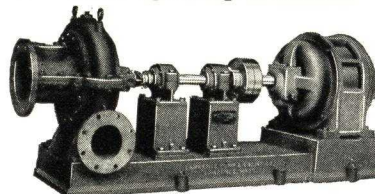
The Electropump is ideal for circulating hot and cold water or brine, for water supply systems and booster service, low pressure boiler feeding, and many other applications.



Type "E" Electropump

Vertical or Horizontal Non-clogging Pumps

Designed especially for the efficient handling of raw sewage, pulp, thick stock, tanner's wastes, slurry, trash, or any liquid containing a large percentage of solids. Where conditions require, they are furnished to pass solids approximately one pipe size smaller than the discharge opening, without clogging. Besides the non-clogging feature, these units are readily accessible and all wearing parts are heavily constructed throughout, giving long life with minimum renewal under severe operating conditions.



Type "HSP" Non-clogging Pump



Type "VSP" Non-clogging Pump

Acid Pumps

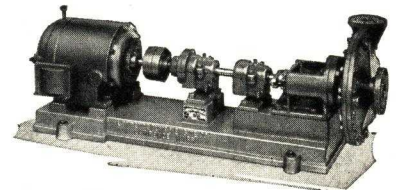
Horizontal and vertical types made of special alloys which will most satisfactorily resist the particular liquids handled. Motor or belt drive.

Single Suction Pumps

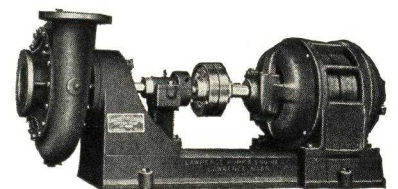
Built in horizontal or vertical shaft type, with open or enclosed impeller.

Capacity 10 to 20,000 gal. per minute, for head conditions up to 150 ft.

Interior surfaces carefully machined, preventing leakage; balanced rotating element, ring oiling bearings, split glands, flexible couplings; efficient, and gives continuous operation with least attention and repairs. Built for direct connection to electric motor, gasoline engine or for belt drive.



Type "VS" Special Design Pump with "Outside" Water Seal



Type "SM" Single Suction Motor Driven Pump

MORRIS MACHINE WORKS

Originators of Centrifugal Pumps, Single- and Multi-stage; Builders for Practically All Purposes Since 1864

BALDWINVILLE, N. Y.

BRANCH OFFICES

NEW YORK, N. Y., 225 W. 34th Street
PHILADELPHIA, PA., Witherspoon Building
CLEVELAND, OHIO, Western Reserve Bldg.

CHICAGO, ILL., 211 West Wacker Drive
BOSTON, MASS., 79 Milk Street
PITTSBURGH, PA., 320 Second Avenue

DETROIT, MICH., New Center Building
CHARLOTTE, N. C., Independence Building

SALES REPRESENTATIVES

BUFFALO, N. Y.

OMAHA, NEB.

KANSAS CITY, MO.

HOUSTON, TEX.

HUNTINGTON, W. VA.

CANADA: Storey Pump & Equipment Co., TORONTO

EXPORT OFFICE: 30 Church Street, NEW YORK, N. Y.

Products

CENTRIFUGAL PUMPS—All sizes for every purpose.
HYDRAULIC DREDGES—Hydraulic Dredges and Conveying Machinery.

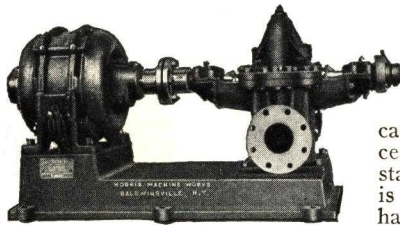
CONTRACTOR'S WATER SUPPLY AND UNWATERING PUMPS.

STEAM ENGINES—Stationary and Marine.

Bulletins

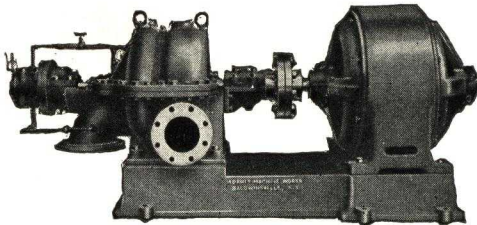
Bulletins describing any Morris Products in detail will be sent on request.

Double-suction Horizontally Split Pumps for General Service



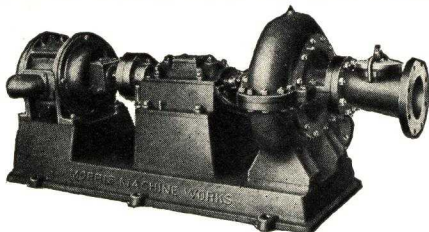
For water supply, factory service, circulating duty, drainage, etc. Double suction equalizes end thrust, and horizontally split casing provides ready access to pump interior. For standard service, the pump is bronze fitted but for handling acids, etc., it can be furnished of bronze or

other acid-resisting metals throughout. Suitable for electric motor, steam turbine, gasoline engine or belt drive. Sizes 1½ in. to 24 in. for total heads up to 250 ft. or about 110 lb. per sq. in. per stage. For high heads, these pumps are furnished in two or more stages.



Non-clogging Pumps

For handling liquids containing fibrous matter and trash such as sewage, paper stock, etc. Have large, smooth passageways



through impeller and pump casing to prevent clogging. The casing is provided with removable disc on each side to permit ready removal of impeller and shaft, and with large handhole for ready access to the

interior. Made both horizontal and vertical for belt or direct drive. Sizes 3 in. to 30 in.

Slurry and Sludge Pumps

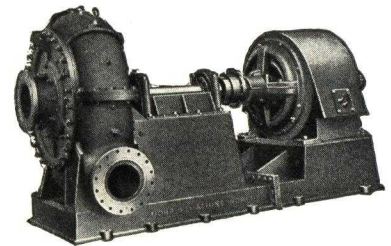
For mixtures of liquids and abrasive solids such as slurry in cement mills, milk of lime, soda ash, sludge in ore treat-



TRADE-MARK

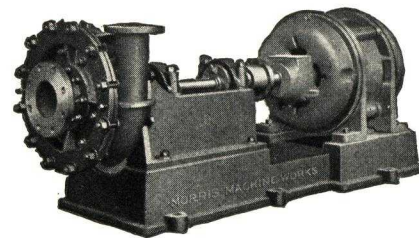
ing plants, etc. Particularly rugged construction, and built with heavy and easily renew-

able parts of wear-resisting materials. Sizes 1½ in. to 6 in., both horizontal and vertical, belt or direct drive.



Sand and Dredging Pumps

For sand, gravel and other abrasive materials. Extremely rugged and heavy construction throughout, with large clearances to prevent clogging. Parts subjected to the greatest wear are



of manganese steel or other wear-resisting alloys and are easily renewable. Furnished with removable linings of suitable alloys for particularly severe service. Sizes 2 in. to 48 in., for heads up to 150 ft., and for belt or direct drive.

Hydraulic Dredges

We have specialized longer than any other manufacturer in building hydraulic dredge machinery for all classes of service, such as harbor and channel improvements, water front developments, hydraulic fills, sand and gravel production, hydraulic stripping and mining, etc. We furnish complete dredge with pump and all accessory equipment or the pump only with blue prints and instructions for building the dredge.

Screw Pumps

For handling large volumes of water against low or moderate heads such as for irrigation, drainage, storm water disposal, sewage pumping, etc., at speeds suitable for direct connection to electric motor. The great simplicity, large passageways, low first cost and low maintenance cost of these pumps, combined with their high efficiency make them ideal for that class of service. Sizes 20 in. and larger, both horizontal and vertical, and for belt or direct drive.

Miscellaneous Pumps

We also build centrifugal pumps for contractors' use; circulating and ballast pumps for direct connection to steam engines; sump and drainage pumps, sinking pumps, irrigation pumps, etc.

We are prepared to build special units for large volume, high heads or other unusual requirements.

Vertical Steam Engines

Reciprocating type, with single and double cylinders and also compound and triple expansion. Built in all sizes from 3 hp. to 1000 hp., both reversing and non-reversing. Suitable for every class of marine and stationary service, as well as for direct connection to pumps, fans, blowers, generating sets, etc.

THE F. E. MYERS & BRO. COMPANY

ASHLAND, OHIO

Products

DEEP WELL POWER HEADS; SHALLOW WELL POWER PUMPS; LIFT and FORCE PUMPS; CYLINDERS.

Also Water Systems, Hay Tools, Door Hangers.



TRADE-MARK

Myers Self-Oiling Shallow Well Pumps

These pumps are of the horizontal double acting self-oiling type. They are designed for lifting water from wells, cisterns, etc., 24 ft. or less in depth and forcing it to an elevation. Suitable for general service, such as pumping hot or cold water, oil, gasoline and similar liquids. They are also excellent boiler feed or booster pumps.

Construction—They have large valves, liberal and direct water ways, a positive self-lubricating system, improved method of power application, housed working parts and other features which permit of operation against heavy pressure or at high speed securing large volume and high efficiency at a minimum

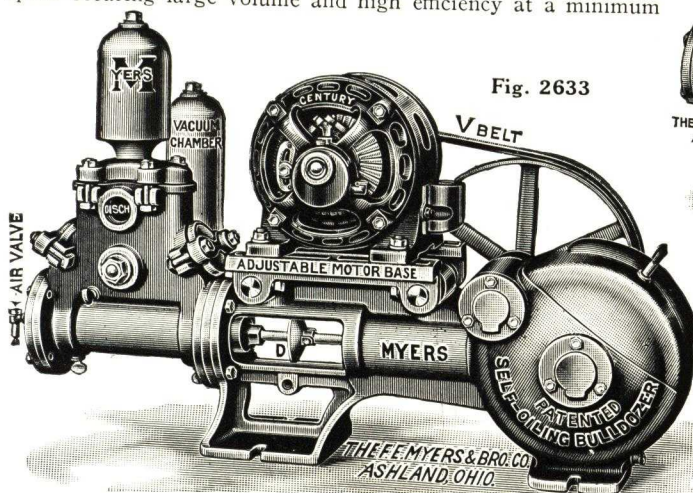


Fig. 2633

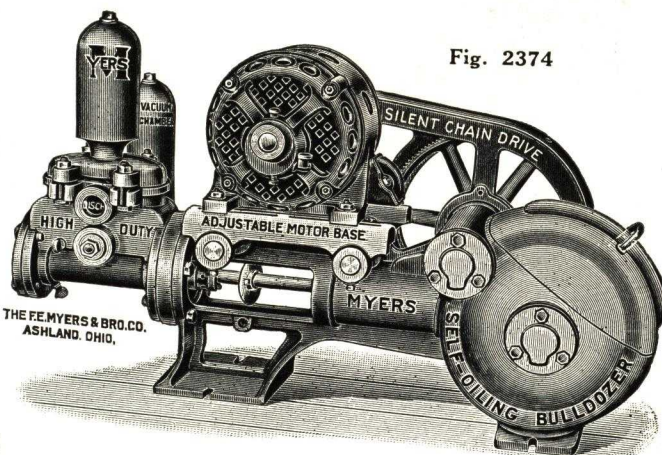


Fig. 2374

signed for a wide range of service and when used with pressure systems are equipped with an air valve which permits of

of cost and without the fear of accidents or breakage through carelessness, poor lubrication or exposed parts.

Types and Sizes—Myers Self-Oiling Bulldozer Power Pumps are now built in twelve sizes with capacities ranging from 250 to 9000 gal. per hour. They are de-

the water and air being pumped into the pressure tank through a single discharge line. They are furnished with tight and loose pulleys for engine, or large pulley and belt tightener for motor, or with motor for silent chain drive, are self-contained, strong and compact, and are complete, ready for installation under all kinds of conditions, and with any style or make of pressure tank. A few of the more important sizes are listed. Other styles and sizes are illustrated, described and listed in our complete catalogue, a copy of which will be mailed to any one who may be interested.

Myers Centrifugal Pumps

Myers Horizontal Single Stage Single Suction Centrifugal Pumps are designed and built to measure up in every way to the high standard of performance established by other Myers Hand and Power Pumps. Simple, durable construction, high in efficiency and quality but moderately priced, they embody the most recent advances in design and construction, and the critical purchaser will appreciate refinements which are usually found only in higher priced equipment. These pumps are available in capacities from 20 to 400 g.p.m. and for operation against heads up to 125 ft.

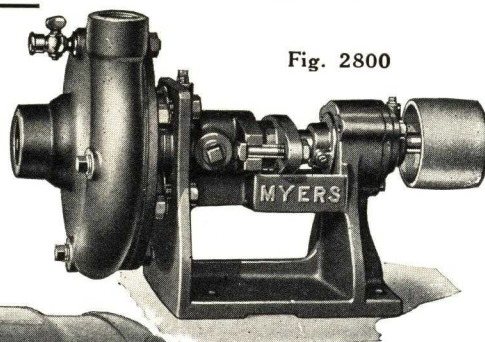


Fig. 2800

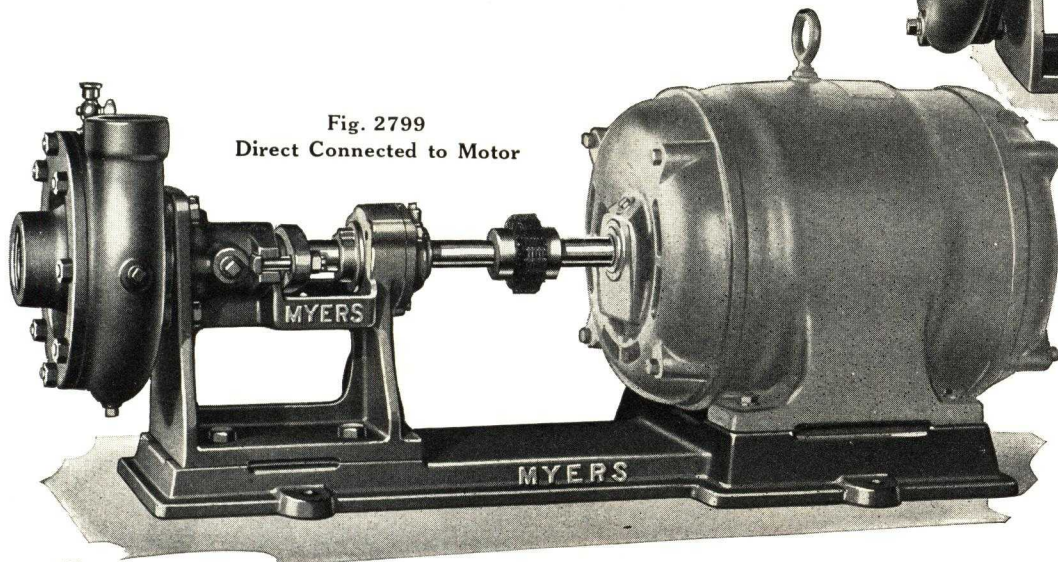


Fig. 2799
Direct Connected to Motor

Anti-friction bearings and precision machine work insure dependable performance and long life. Cases and impellers are furnished either in cast iron or bronze and shafts are either plain or stainless steel. Line shaft, engine or motor power. Furnished with or without engines or motors as desired. Ask for catalog illustrating and describing this new line of quality built Myers Centrifugal Pumps.

Myers Self-Oiling Deep Well Power Pumps or Working Heads

For lifting water from wells of greater depth than 24 ft. and delivering it to ground level or forcing it into elevated tanks or reservoir.

Sizes—Like Myers Self-Oiling Power Pumps for shallow wells, all gears and working parts are fully enclosed and operate in oil. This not only insures perfect lubrication that reduces wear and breakage to a minimum, but permits of operation at greater speed and against heavier pressure than can be accomplished by older types of pumps. Main frame forms oil reservoir from which the gears distribute oil to all moving parts.

Bearing shafts are high grade machinery steel; bearings and working parts removable. Larger volume at a lower cost, fewer delays through accidents and breakage, continuous 24-hour day service, freedom from care and attention, are some of the accomplishments of Myers Self-Oiling Deep Well Power Pumps which are now built with 6, 9, 12, 18 and 24-in. stroke.

Types—They are designed for installation wherever deep well power service is required. Figures shown are an excellent illustration of the regular deep well power pump or working head for forcing water a distance, pumping it into elevated tanks or discharging it at the pump. Some styles have been fitted with air compressors, for use with a pressure tank. Others are equipped with a 4-ft. anti-freezing set length which permits installation in places exposed to temperature extremes. Tight and loose pulleys for engine drive, or large pulley and belt tightener for motor power, or complete with motor mounted on head for belt or silent chain drive are regularly furnished on all styles. Size and equipment will be found in the table. See Myers complete catalogue for additional sizes, prices, etc.

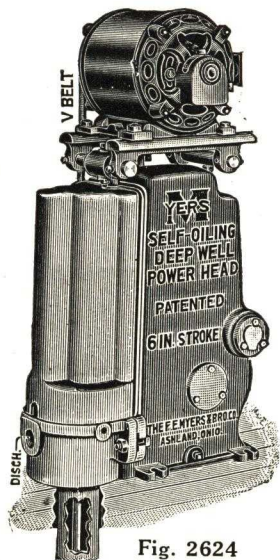


Fig. 2624

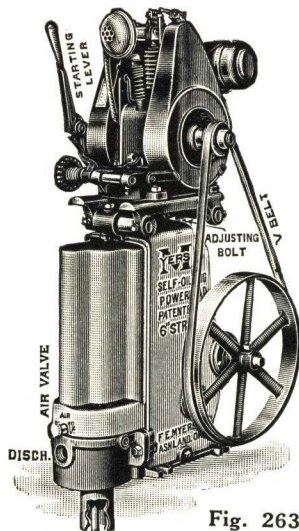


Fig. 2636

Six-inch stroke self-oiling deep well heads complete with motor or engine and V-belt drive, and equipped with air cylinder for pressure tank service

FOR DEEP WELLS (25 FEET OR MORE)*

Style pump	Max. speed up strokes, min.	Drop pipe, in.	Diam. cyl., in.	Gal. per min. Fig. 2664 double act. cyl.	Can be used in well pipe diam., in.	Max. hp. motor required and depth of well in ft.			
						1/2	1	2	3
6" stroke S-O head, 40-lb. tank pressure	44	2	1 13/16	4.62	3	30	100	175	225
	44	2 1/2	2 1/4	7.10	3 1/2		30	80	150
6" stroke S-O head, open tank	44	2	1 13/16	4.62	3	120	192	265	320
	44	2 1/2	2 1/4	7.10	3 1/2		120	172	242
9" stroke S-O head, 50-lb. tank pressure	37	2	1 13/16	5.80	3	1	1 1/2	2	3
	37	2 1/2	2 1/4	9.00	3 1/2	200	300	400	600
	37	3	2 3/4	13.50	4 1/2	60	140	225	375
	37	3 1/2	3 1/4	19.00	5		60	100	230
	37	4	3 3/4	25.00	6			50	125
9" stroke S-O head, open tank	37	2	1 13/16	5.80	3	315	415	515	715
	37	2 1/2	2 1/4	9.00	3 1/2	175	255	340	490
	37	3	2 3/4	13.50	4 1/2		175	215	345
	37	3 1/2	3 1/4	19.00	5		115	165	240
	37	4	3 3/4	25.00	6		85	141	180
12" stroke S-O head, 50-lb. tank pressure	34	2 1/2	2 1/4	11.00	3 1/2	1 1/2	2	3	5
	34	3	2 3/4	16.50	4 1/2	100	160	310	550
	34	3 1/4	3 1/4	23.30	5	30	75	150	320
	34	4	3 3/4	30.85	6		26	80	200
12" stroke S-O head, open tank	34	2 1/2	2 1/4	11.00	3 1/2	215	275	425	665
	34	3	2 3/4	16.50	4 1/2	145	190	265	435
	34	3 1/2	3 1/4	23.30	5	100	140	195	315
	34	4	3 3/4	30.85	6	75	100	150	240
	34	5	4 3/4	49.65	7	40	60	90	160
18" stroke S-O head, No. 664M, open tank	25	4	3 3/4	34.00	6	3	5	7 1/2	10
	25	5	4 3/4	54.85	7	120	215	340	465
	25	6	5 3/4	81.50	8	70	140	215	290
	25					45	90	140	195
24" stroke S-O head, No. 771M, open tank	22	4	3 3/4	40.00	6	3	5	7 1/2	10
	22	5	4 3/4	64.40	7	90	175	280	390
	22	6	5 3/4	95.00	8	60	100	175	240
	22					40	75	115	175

*As used for pneumatic water systems and other tank work, with tabulated list of capacities and horsepower required to operate under different conditions.

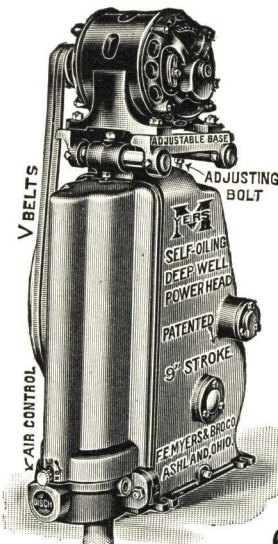


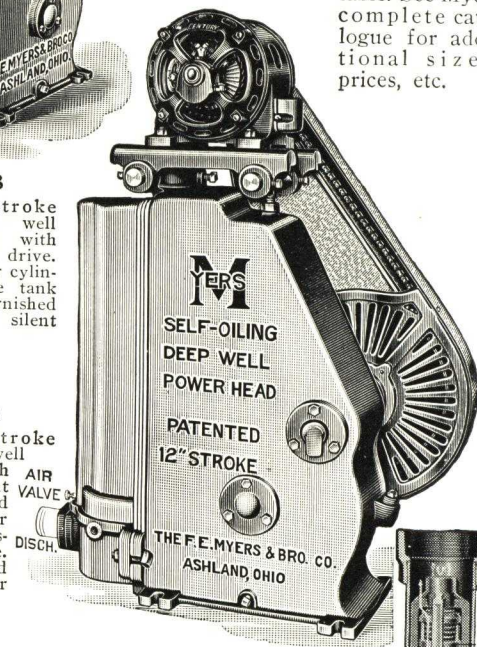
Fig. 2628

Nine-inch stroke self-oiling deep well head. Complete with motor and V-belt drive. Equipped with air cylinder for pressure tank service. Also furnished with motor and silent chain drive

Right:

Fig. 2528

Twelve-inch stroke self-oiling deep well head complete with motor for silent chain drive and equipped with air cylinder for pressure tank service. Also furnished with motor for V-belt drive



Myers Brass Lined Working Barrels

Designed for use with Myers power pumps and working heads for pumping water from deep wells with quick closing spring cushion pop-spool valves or with bronze ball valves.

Shell is heavy brass or wrought steel lined with special heavy seamless drawn brass tube, swaged out at upper end and tapered to form seat for check valve. Composition metal fills space between lining and shell.

Made in different styles and all standard sizes, meeting depth, capacity and operation requirements.

Other Important Myers Products

Well, house and cistern pumps; tank pumps and pump standards; hand and power water systems; hand and power spray pumps and spraying accessories. Auto washers. Hay and grain unloading tools. Barn, garage and factory door hangers. Store ladders, etc.

Complete information, catalogue and prices on request. Separate bulletins on any of the above products mailed promptly.

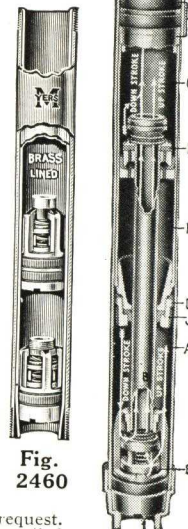


Fig. 2460

Fig. 2664

QUIMBY PUMP CO., INC.

Precision-made Pumps of Demonstrated Efficiency for Almost Every Need

340 Thomas Street, NEWARK, N. J.

BRANCH OFFICES AND SALES REPRESENTATIVES IN PRINCIPAL CITIES

QUIMBY SCREW PUMPS

Only Two Moving Parts, High Efficiency, Rugged Construction, Dependable, Long Life

Uses

These pumps are used for an almost unlimited number of purposes. They have been in successful use for many years on hydraulic elevators; as booster pumps for house water service; for handling calcium brine; hot and cold water circulation; fuel oil, sulphuric acid sludge, paraffin distillate, hot oils; in conjunction with fire extinguisher sprinkler systems and for the operation of water wheel governors where a pulseless discharge under conditions of continuous operation is essential.

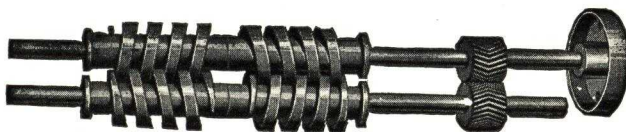
Capacities and Pressures

Quimby Screw Pumps are built to handle any liquid or semiliquid that will flow through suction pipes in capacities from 2 to 4200 g.p.m. at pressures, depending on the viscosity, up to 800 lb. per sq. in. On inert liquids, such as water or calcium brine, the maximum pressure is 200 lb.; on irritant liquids such as gasoline, naphtha, turpentine, etc., hot oils over 350° F. and crude oils under 100 seconds Saybolt Universal, maximum pressure 100 lb.

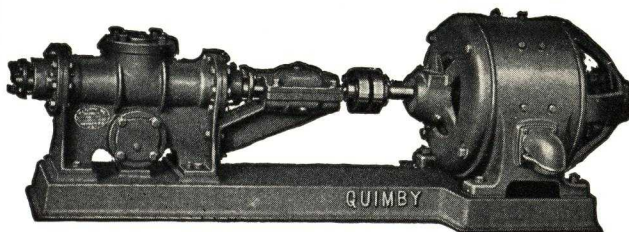
Construction

Extremely simple. There are but two moving parts which are parallel shafts on which are mounted four screws arranged in pairs so that the thread of one screw projects to the bottom of the space between the threads of the opposite screw.

The screw threads have flat faces and undercut sides, the



The Only Two Moving Parts in a Quimby Screw Pump



Quimby Standard Screw Pump

width of the face and base of the thread being one-half of the pitch. Sufficient clearance is left between the screws and the cylinder wall and between the faces of the intermeshing threads to allow a close running fit without actual contact.

One shaft is directly connected to the motor or other source of power and the other is driven from it by herringbone gears. For pumps handling oil with lubricating qualities these gears are placed inside the chamber and lubricated by the oil being pumped.

Operation

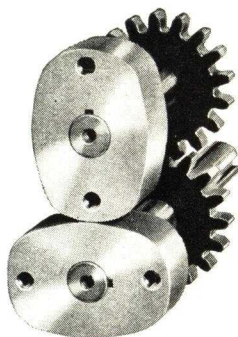
The liquid passes through a suction chamber below the pump to the two ends of the cylinder where it is trapped by the screws and forced towards the center discharge chamber.

End thrust on the screws in their bearings is eliminated because the endwise pressure on one pair of screws is exactly balanced by a like pressure in the other direction on the other pair. Shaft stuffing boxes being on the suction side, there is no tendency to blow out the packing.

The pump operates at high speed suitable for direct connection to a motor or turbine without the use of back gearing. It is quiet in operation, the hum of the motor or turbine only being heard. There is no vibration, so that no anchor bolts are required. The pump has no valves and the discharge is pulseless without the use of an air chamber.

OTHER QUIMBY PUMPS

Quimby S. B. U. Pump



Pistons of the S. B. U. Pump

Only two moving parts

For fresh or salt water; gasoline; kerosene; alcohol; beer; milk; fuel, lubricating and crude oils; syrup and chemicals. This pump will handle any liquid—hot or cold, thick or thin—without pulsation and at the fastest speed at which that liquid can be made to flow.

Its outstanding features are briefly: *higher speed; self-priming; high efficiency; more uniform flow; high suction lifts; high pressure; simplicity*—the pump has only two moving parts, the two cam-shaped pistons which revolve in opposite direction in fixed relation to each other; *dynamic and hydraulic balance; reversible rotation.*

Made in 4 sizes—22, 90, 150 and 450 g.p.m. Larger capacities to order. Speeds from 500 to 3500 r.p.m. Discharge Pressures: water, 50 lbs.; oils, 150 lbs. and higher depending on capacity and viscosity. Complete data on request.

Quimby Centrifugal Pumps

Quimby Centrifugal Pumps are made in a wide variety of designs and capacities for industrial, municipal and marine application.

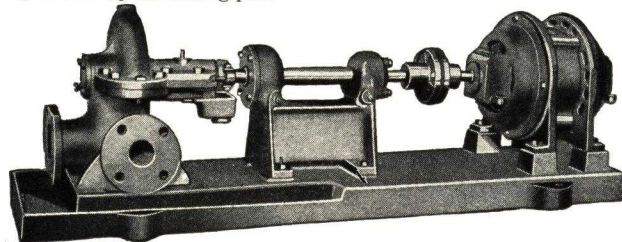
We build a complete line of circulating and ballast pumps; sump and bilge pumps; sewage ejectors; condensation return units, etc.

Quimby Doty Non-corroding and Rubber-lined Pumps for the Process Industries

These are non-corroding ball bearing pumps especially designed for handling fluids different from water: corrosive, abrasive, high temperature, "creepy," easily contaminated fluids and semifluids. The efficiencies are far higher than usually considered possible for this type of service, comparing favorably with water pump efficiencies.

Any machinable material, such as aluminum, barberite, bronze alloys, copper, illium, iron, lead, monel metal, open hearth or stainless steel, can be used in the construction. This enables the user to secure pumps suited to his individual conditions yet not "special" in development cost.

Quimby Doty pumps can be adapted to such different processes as chemical, dyes, explosives, paper mill liquors and bleaches, petroleum and plating, rayon and cellophane, refrigeration, tanning, textiles, *hydrochloric acid*, ferric chloride, etc. Capacities up to 1500 g.p.m.



Quimby Doty Single Suction Pump

Let us help you select a pump that will meet your specific requirements

THE NASH ENGINEERING COMPANY

201 Wilson Road
SOUTH NORWALK, CONN.

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES

Products

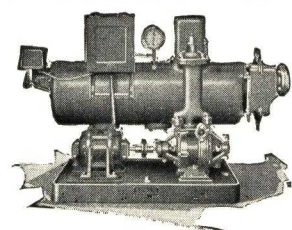
Return line and air line VACUUM STEAM HEATING PUMPS; CONDENSATION PUMPS; CENTRIFUGAL PUMPS, Standard and Suction; COMPRESSORS and VACUUM PUMPS for air and gases; SEWAGE EJECTORS; SEWAGE PUMPS; SUMP PUMPS.

Return Line Vacuum Steam Heating Pump

Removes air and condensation from return lines of vacuum steam heating systems, discharges the air to the atmosphere, and returns the water to the boiler.

Pump consists of two independent units combined in a single casing—an air unit and a water unit. Impellers of both units are mounted on the same shaft, supported on annular ball bearings outside the casing. Pump is bronze fitted.

Air unit exhausts air and vapors and delivers these to the atmosphere without back pressure. Water unit removes the condensation and pumps it directly into the boiler. By handling the air independently of the water, power is saved.



Jennings Motor-driven Return Line Vacuum Steam Heating Pump

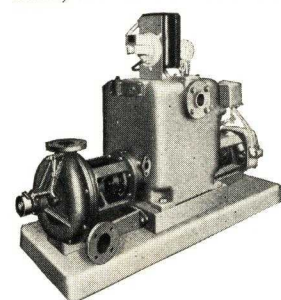
Supplied either direct-connected to standard electric motors, for belt drive, or for steam turbine drive. For continuous operation, or with automatic control.

Furnished in standard sizes with capacities ranging from 4 to 400 g.p.m. of water and 3 to 171 cu. ft. per minute of air. For serving up to 300,000 sq. ft. of equivalent direct radiation.

Jennings Vapor Turbine Vacuum Heating Pumps

This is a new product of THE NASH ENGINEERING COMPANY. It combines all the advantages of the standard return line heating pumps with a new type of drive, a specially designed low pressure turbine which operates directly on steam from the heating mains. Requires a differential of only 5 in. of mercury, and returns that steam to the heating system with practically no heat loss.

This pump affords the safety and economy which goes with a continuous condensation return and steady vacuum, and at no cost for electric current.



Jennings Vapor Turbine Return Line Vacuum Heating Pump

This outfit is equipped with a complete electrically operated stand-by unit that will automatically operate should the turbine be cut out for inspection or servicing.

Furnished in standard sizes with capacities ranging from 10 to 30 g.p.m. of water, and 3 to 10 cu. ft. per min. of air. For services up to 30,000 sq. ft. equivalent direct radiation. Larger sizes built special.

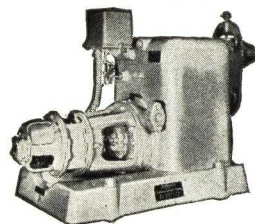


Condensation Pump

Removes the condensation from radiators in return line steam heating systems, particularly radiators set below the boiler water line level, and

pumps the condensation back to the boiler.

By making the pump casing a part of the return tank, and bolting the motor base to the tank, floor space is conserved. The rectangular construction permits installation in a corner against the wall.



Jennings Motor-driven Condensation Pump

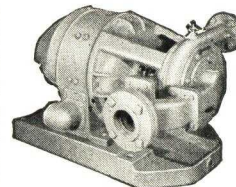
Supplied in standard sizes with capacities ranging from 4 to 200 g.p.m. of water. For serving up to 150,000 sq. ft. of equivalent direct radiation.

Standard Centrifugal Pump

For all centrifugal pump services.

Compact—motor armature and pump impeller are mounted on the same shaft. Simplified—no bearings in pump casing, only one stuffing box. Accessible—pump impeller can be removed without breaking pipe connections, touching packing, or disturbing shaft alignment.

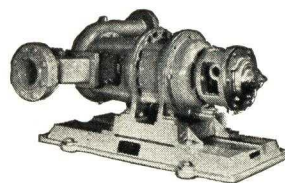
Sizes 1, 1¼, 1½, 2, 3, 4 and 6 in. Capacities to 2000 g.p.m., heads to 300 ft. Bronze fitted standard construction; also all-bronze or all-iron for special services.



Jennings Motor-driven Standard Centrifugal Pump

Centrifugal Pump Operating with Suction Lift

When the Jennings Suction Centrifugal is started, the built-in Nash Hytor Vacuum Pump exhausts the air from the casing and suction piping. Water is quickly drawn into the pump. Full rated capacity is delivered without delay.



Jennings Motor-driven Suction (Self-priming) Centrifugal Pump

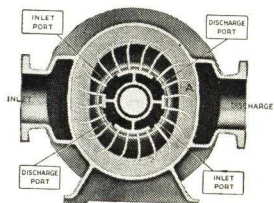
Successful performance is assured under conditions where water level is likely to fall, or where air or gas is handled together with the water being pumped. Intermittent operation is possible without a foot valve.

Furnished in standard sizes with capacities up to 2000 g.p.m. Heads up to 300 ft.

Supplied either bronze fitted or all-bronze construction.

Compressors and Vacuum Pumps for Air and Gases

Operation is as follows: The rotor, consisting of a cylindrical hub, around the periphery of which are chambers or spaces formed by heavy shrouds cast integrally, revolves freely in an elliptical casing or housing filled with water.



New Conical Type Nash Hytor Compressor or Vacuum Pump
Showing the unique principle of hydro-turbine operation

As the rotor turns, it carries the water around with it. The water, under the influence of centrifugal force, is compelled to follow the contour of the casing, and alternately to enter and to leave the rotor chambers, twice in each revolution.

As the water recedes from the rotor, air is drawn through the cone inlet port and then through the ports in bottom of rotor chambers into the rotor. As the water is subsequently forced back into the rotor by the converging casing, the air is compressed and then discharged through the ports in bottom of rotor chambers, then through cone outlet ports and finally out through pump discharge.

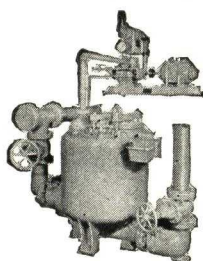
A separator, supplied with each compressor, frees the delivered compressed air of entrained moisture.

Supplied in several standard sizes for handling up to 6000 cu. ft. of air per minute. Regularly supplied for pressures up to 35 lb.; vacuums up to 20 in. of mercury. For higher pressures and vacuums, special equipment will be furnished.

Sewage Ejector

For pumping unscreened sewage or drainage from basements below the street sewer level, handling crude sewage from low level districts, pumping effluent, sludge and other heavy liquids.

The Jennings Sewage Ejector is of the pneumatic type. Air, compressed to the necessary working pressure by a Nash Hytor Air Compressor, is used as the motive power to pump the accumulated sewage from a pot to the sewer. Air is compressed only to the pressure at which it is used. There are no air



Jennings Pneumatic Sewage Ejector

storage tanks, reciprocating air compressors or screens. Air valves and reducing valves are avoided.

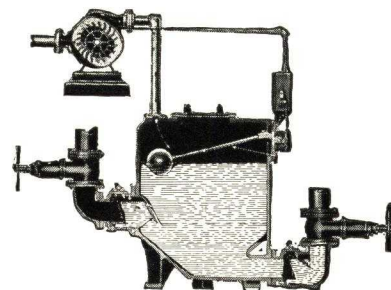
Operation is as follows:

Sewage, under the action of gravity, flows through the inlet check valve into the pot. As it accumulates, it raises a ball float which, when the

pot is full, actuates a float switch, thereby starting up the Nash Hytor Air Compressor.

Compressed air is delivered into the top of the pot, closing the inlet check valve and expelling the sewage through the outlet check valve. When the pot has been emptied, the float, having reached the lower limit of its travel, opens float switch stopping compressor, through which, then, the air in the pot is vented. Sewage again flows by gravity into the pot, repeating the cycle.

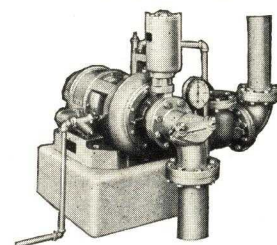
Furnished in several standard sizes up to 1500 gal. per minute against heads up to 50 ft.



Ejector Discharging

Suction Sump and Sewage Pumps—Standard Type

The Jennings Suction Sump Pump is a self-priming centrifugal pump for handling seepage water and liquids reasonably free from solids. The Suction Sewage Pump is fitted with a non-clog type impeller. Both pumps are mounted entirely above the sump where they are always readily accessible. Only the suction pipe is submerged.



Jennings Motor-driven Suction Sewage Pump, Standard Type

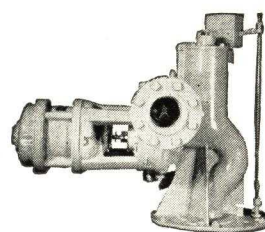
There are only two moving parts: the centrifugal impeller and the vacuum priming pump rotor. Both rotate without metal-to-metal contact in the casing. Both are mounted on the same shaft that carries the rotor of the driving electric motor, making possible a single compact assembly.

Capacities and heads to meet all requirements.

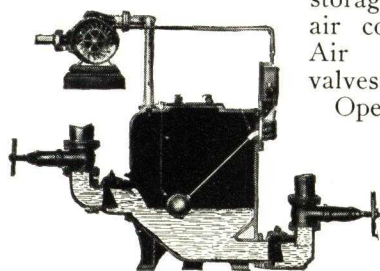
Suction Sump and Sewage Pumps—Pedestal Type

Jennings Suction Sump and Sewage Pumps, Pedestal Type, provide even greater convenience and compactness. This type pump is mounted directly on the pit cover and requires no other foundation. The base of the pump fits a standard manhole and, when bolted down, forms a gas-tight cover.

Furnished only in medium capacities and heads.



Jennings Motor-driven Suction Sewage Pump, Pedestal Type



Ejector Filling

Bulletins

- No. 15 Jennings Return Line Vacuum Steam Heating Pumps, piped-up type
- No. 17 Jennings Air Line Vacuum Steam Heating Pumps
- No. 40 Jennings Flat Box Pumps
- No. 85 Jennings Return Line Vacuum Steam Heating Pumps, manifold type
- No. 99 Jennings Condensation Pumps
- No. 103 Jennings Sewage Ejectors, Type B
- No. 108 Jennings Sewage Ejectors, Type A

- No. 147 Jennings Return Line Vacuum Steam Heating Pumps, unit type
- No. 155 Jennings Centrifugal Pumps
- No. 159 Jennings Suction Sump Pumps
- No. 161 Jennings Suction Sewage Pumps
- No. 188 Jennings Suction Sewage Pumps, pedestal type
- No. 192 Nash Hytor Vacuum Pumps and Compressors, Conical Type
- No. 203 Jennings Vapor Turbine Return Line Heating Pumps

ROOTS-CONNSVILLE-WILBRAHAM

THE CONNSVILLE BLOWER CO., INC., THE P. H. & F. M. ROOTS CO., WILBRAHAM-GREEN BLOWER CO.

16th Street and Kentucky Avenue, CONNSVILLE, IND.

BRANCH OFFICES

NEW YORK, N. Y., 24 State Street
CHICAGO, ILL., 20 No. Wacker Drive

POTTSTOWN, PA., P. O. Box 47
PITTSBURGH, PA., 207 Fulton Building
SAN FRANCISCO, CAL., 620 Hearst Building

ST. LOUIS, MO., 3314 Morganford Road
DALLAS, TEX., 309 Southland Life Building

Principal Products

ROTARY BLOWERS and GAS PUMPS for moving air or gas under pressure or vacuum; CENTRIFUGAL BLOWERS and GAS PUMPS; ROTARY VACUUM and LIQUID PUMPS; CENTRIFUGAL PUMPS, including non-clogging types; TURBINE PUMPS; ROTARY DISPLACEMENT METERS for air, gas or oil.

Miscellaneous: Inert Gas Producers, Superchargers, Portable Vacuum and Blowing Units, Blast Gates, etc.

Rotary Blowers and Gas Pumps

Blowers—Built in many sizes and styles for 5 to 50,000 cu. ft. per minute at pressures ranging up to 12 lbs. per sq. in., or for equivalent vacuums.

Characteristics — A known volume of air definitely displaced each revolution of the impellers (see

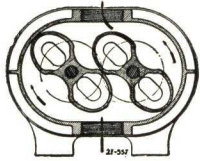
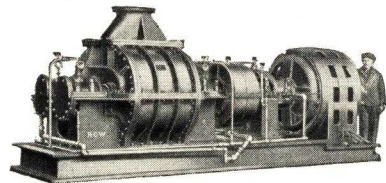


diagram below); high efficiencies; low power cost per cu. ft. of air handled; clean air because of no internal seal or lubricant. These characteristics are valuable in many industrial processes, including combustion, pneumatic conveying, agitation and aeration, forced ventilation, etc. Illustration above is typical of smaller size Blowers and Gas Pumps. In addition to V-belt drive shown, these units are also available in single pulley or direct-coupled driving arrangements. Anti-friction or sleeve bearings. Heat-treated steel gears available for heavy service.

Gas Pumps—Gas Pumps, Exhausters or Boosters are constructed in about same general range of sizes and pressures as the Blowers, but with special features adapting them to handling gases and vapors.

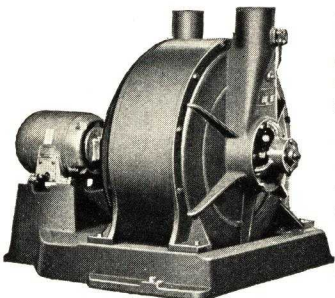
Patented stuffing boxes, reinforced head plates, correct ribbing to withstand the extra stresses—all increase the serviceability of these modern Gas Pumps.

Illustrated by cut at left is a large unit direct-coupled to motor. Larger units, both Blowers and Gas Pumps, are available with any standard drive, multi-V-belt, etc.



Centrifugal Blowers and Gas Pumps

Centrifugal Blowers, Exhausters and Compressors, for air or gas, are built for capacities up to 30,000 cu. ft. per minute at pressures up to 10 lbs. Available in side inlet or double suction types, and in single and multi-stage units.



Built for direct connection to motor or steam turbine; and in smaller sizes, in the close-coupled type, impeller is mounted direct on extended motor shaft.

These Blowers can be furnished in special alloys to resist corrosion or abrasion, as may be required in any specified application.

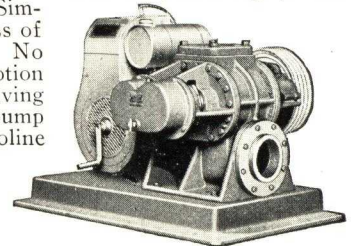
The long experience of this organization, specializing in equipment for handling air and gas, coupled with unusual facilities for

building and testing such units, assures a product that offers maximum service and efficiency under all conditions.



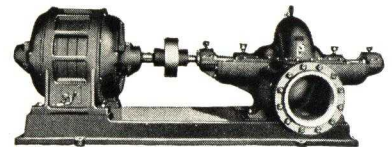
Rotary Vacuum and Liquid Pumps

For handling heavier viscous liquids in quantities of 10 gals. per minute, and larger, at heads up to 150 ft., or for producing vacuums up to 26 in. HG, handling air and liquids simultaneously. Simplicity of design and sturdiness of construction are features. No valves, springs, or buckets. Motion is rotary without reversals, giving large capacities. Type "R" pump illustrated is V-belted to gasoline engine, but all other standard driving arrangements are also available. Low power consumption and freedom from maintenance expense are features of these Rotary Pumps for heavy duty vacuum and liquid service.



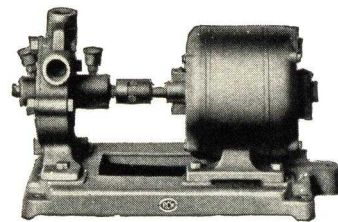
Centrifugal Pumps

R-C-W Centrifugal Pumps, including non-clogging types, are built in sizes ranging from 40 to 20,000 gals. per minute, and for pressures up to 1500 lbs. per sq. in. Impellers of correct hydraulic design, eliminating end thrust and balancing devices, can be made of special alloys for handling corrosive or abrasive liquids. Economy and reliability of these pumps are based on designs perfected during 22 years of active experience in building centrifugal units. Pump shown is a Type "A" double suction, single stage unit.



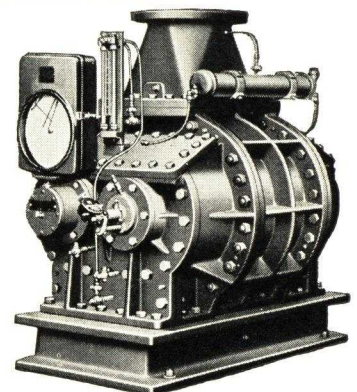
Turbine Pumps

Patented taper-edge impeller makes it possible to regulate quantity to requirements, even though constant speed motors drive pumps. Suitable for handling water, brine, light oils, chemicals, and numerous other liquids, in volumes of 3 to 300 gals. per minute at heads of 350 ft. and higher. Simple design, sturdy construction, compact size, and light weight are some of the other features of this modern pump. Ability to handle high heads, without multistaging, is a great advantage.



Rotary Displacement Meters

Dependable accuracy is combined with low installation and maintenance cost, small space requirements, and practically no operating expense. Actuated by the flow of gas through the Meter, its rotating impellers allow only definitely calculated and proven quantities to pass each revolution. Low-pressure types range up to maximum peak line pressure of 25 lbs., while the high-pressure types range up to 75 lbs. Special arrangements can be provided for pressures up to 300 lbs. and higher.



Literature on Request

Descriptive matter covering all types of equipment listed above will be forwarded promptly upon request.

ESTABLISHED 1859

TABER PUMP CO.

Centrifugal, Submerged Vertical, Rotary, Sump Sewage and Specially Engineered Pumps

295 Elm Street, BUFFALO, N. Y.

Taber Pumps

Standard and specially engineered pumps of the types listed above, built of iron, steel, bronze and special alloys, such as Everdur, Allegheny, KA-2, Nickel, Monel, Aluminum Bronze, Semi-steel—to meet specific corrosion problems.

Only a few designs of Taber Pumps can be illustrated here.

Whatever your pump problem you are likely to receive a solution from Taber, through the use of Taber Data Sheet. Quotations will accompany our recommendations.

Bulletins

The TABER PUMP COMPANY will be glad to furnish bulletins on any or all of the units shown below.

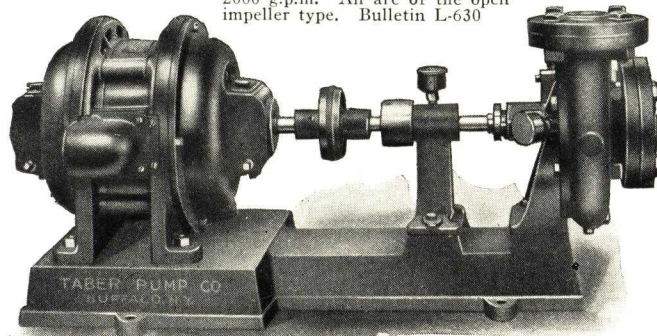
Taber Data Sheets

The Taber Data Sheet is designed to enable you to submit every detail of your pumping problems, from which we can make recommendations and quote you on such pumps as are best suited for your particular needs. No obligation on your part.

Below:

Fig. 190-A

A motor driven single suction centrifugal pump built in all sizes up to 2000 g.p.m. All are of the open impeller type. Bulletin L-630



Below:

Fig. 510

Bronze fitted, double suction type of pump. Highly efficient and extensively used for water and brine circulation. Bulletin DS-330

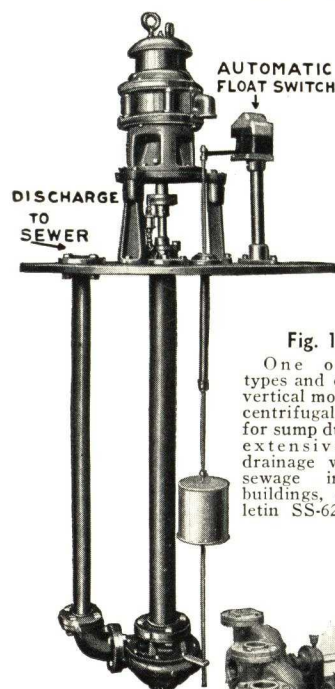


Fig. 194-T

One of many types and designs of vertical motor driven centrifugal pumps for sump duty. Used extensively for drainage water and sewage in public buildings, etc. Bulletin SS-629

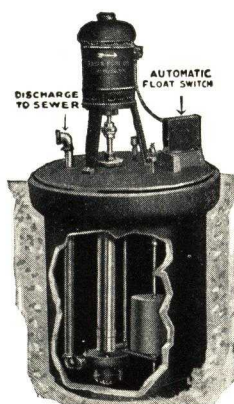


Fig. 194-aB

The Taber Miget sump pump is made to fit into an 18-in. standard tile. Driven by 1/4-hp., 60-cycle, 1750 r.p.m. vertical motor, 110 or 220 volts. Capacities as follows:

Gal. per min.	10	15	20	25
Total head, ft.	23	21	20	18

Bulletin MH-429.

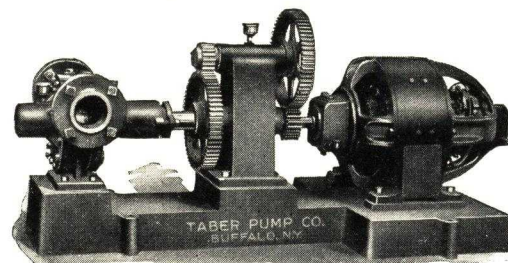
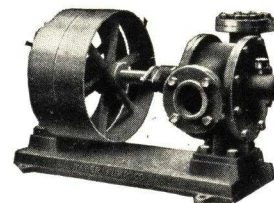


Fig. 830

A heavy duty rotary pump, especially designed for handling viscous materials such as corn syrup and molasses where a slow speed, powerful pump is required. Bulletin R-929



Left:

Fig. 301

Type "R" rotary pump for belt drive. Also made for motor drive. Particularly suited for handling oils, soap stock, and other fluids. Bulletin R-929

Right:

Fig. 6036

Improved double bearing, single suction pump with deep stuffing box. Particularly suitable in the processing industry. Made of all standard and special castable metals and alloys

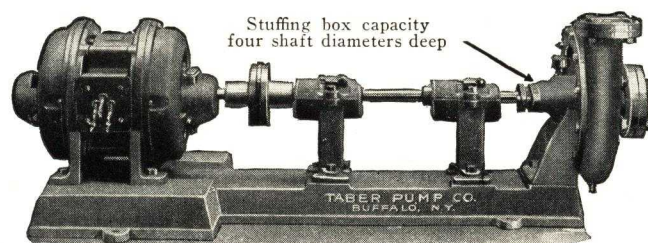
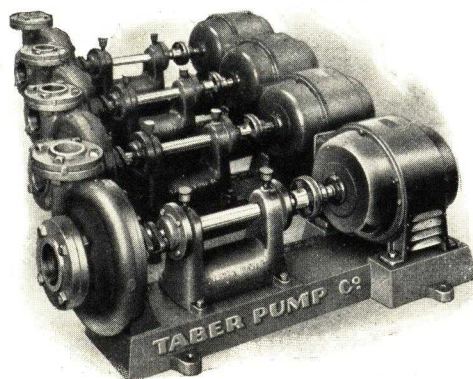


Fig. 603

A type of pump popular in the chemical industries. Deep stuffing box, four shaft diameters deep. No dependence upon bearing in the pump proper. Pump shaft is supported externally. In extensive use for handling caustic soda solutions. Bulletin L-630

WESTCO PUMP CORPORATION

Circulating and General Service Pumps for Handling Commercial Liquids

FACTORY

DAVENPORT, IOWA

BRANCHES IN NEW YORK, PHILADELPHIA, CHICAGO AND SAN FRANCISCO
DISTRIBUTORS IN 50 PRINCIPAL CITIES

Westco's Turbine Principle of Pumping

Liquid is pumped by the rotation of the one-piece Impeller which operates without metal-to-metal contact inside the pump chamber. The liquid is recirculated a great many times through the Impeller vanes during its travel from suction to discharge. Each vane imparts its proportional share of energy to the liquid—resulting in multi-stage performance with only single-stage construction.

An outstanding Westco operating characteristic is that the liquid always circulates through the vanes a sufficient number of times to pump against the existing head. Consequently when the head varies the number of circulations also varies. Thus, Westco automatically adjusts itself to changes in the operating conditions. This patented principle represents the latest engineering achievement in pump construction.

Westco Turbine Pumps are unsurpassed for handling small capacities against high or low heads with remarkable efficiency. This modern Pump operates against pressures in single-stage construction (that is, with only one impeller) that would require a multi-stage pump of the ordinary type centrifugal.

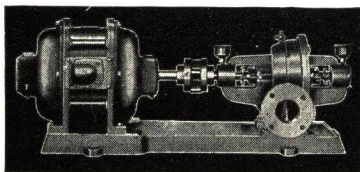
Westco Features

Extreme simplicity, patented removable liners, high pressures in single-stage, low original and maintenance costs, quiet operation, perfect hydraulic balance, low power requirements, no metal-to-metal contact, ball bearing construction, double-suction intake, all parts readily accessible, compact and operates at standard motor speeds.

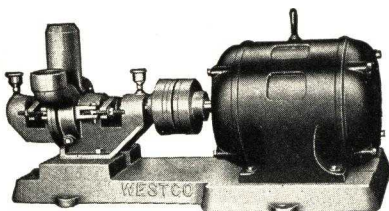
Standard Westco Turbine Pumps

For water supply, house and booster service, brine and drinking water circulation, hot water circulation, boiler feed, elevators, cooling tower supply, air conditioning, sprinkler, tank filling, pumping hot oil, gasoline, acids and chemical solutions, etc.

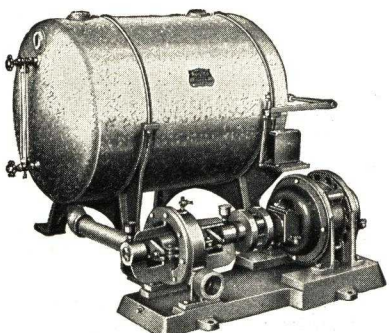
Furnished in cast iron, bronze-fitted, or solid bronze, cast steel, stainless steel or Monel metal. Also made of other non-corrosive and acid resisting alloys. Sizes from 5 to 400 g.p.m. against heads up to 1000 ft. for direct electric motor, steam turbine, gas engine or belt drive.



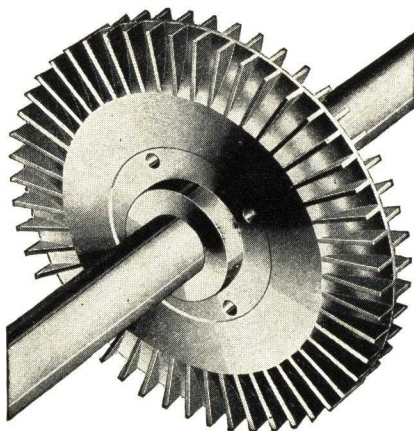
Standard Westco Turbine Pump
Directly driven from motor



Westco Self-priming Turbine Pump



Westco Condensation Pump and Receiver



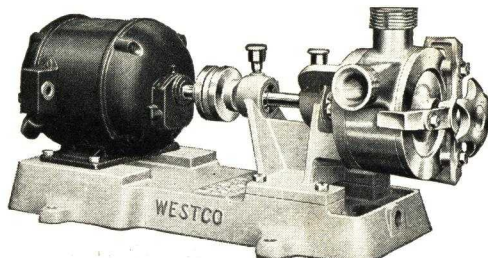
The Impeller

Westco's Only Moving Part

Self-priming Westco Turbine Pumps

For large volume water supply service where source of water is within suction lift. For sump and drainage service, handling volatile petroleum liquids, hot water. Also for transfer service in dairies, chemical plants, etc.

Fitted with Removable Liners which form the liquid passages or races. Each pump accommodates a number of different liner combinations. In this way, a wide range of capacities or pressures may be produced. These extra liners are inexpensive and can be furnished in special non-corrosive alloys. Sizes range from 7 to 50 g.p.m. against heads up to 350 ft. Electric motor, steam turbine, gas engine or belt drive.



Westco Sanitary Turbine Pump

Westco Condensation Pumps and Receivers

Use with radiation systems, heaters, steam coils, etc., for returning hot condensate to high or low pressure steam plants. Saves large volumes of water and considerable fuel. Induces proper circulation.

Bronze-fitted, double-suction, ball bearing Westco Pump. Steel plate tank, galvanized inside and outside. Easy to clean. Operates efficiently against 50% variations (up or down) in head. Handles large volumes of steam or air. Does not vapor bind. Extremely compact. Quiet. Sizes for service on layouts with 2000 to 50,000 sq. ft. radiation surface, requiring from 4 to 400 g.p.m. against heads up to 1000 ft.

Westco Sanitary Turbine Pumps

For handling beer, hot or cold milk, sour or sweet cream, skim milk, whey, ice cream mix, vegetable oils, beverages, etc.

Made in non-corrosive stainless metals. Simple construction—easy to clean. Delivers steady, non-fluctuating flow at all times. Cannot contaminate liquid being pumped. Sizes from 5 to 200 g.p.m. to operate against heads up to 100 ft. Direct motor, steam turbine or belt drive.

Westco Automatic Water Systems

For supplying water to suburban and farm homes, schools, greenhouses, booster service, etc.

100% automatic and self-priming. Bronze-fitted, double-suction Westco Pump. Quiet operation. Capacity increased or decreased without disturbing installation.

Removable all bronze liners protect casings from any possible wear due to foreign matter. 28 ft. suction lift. No water-hammer or pounding in pipes. Tank cannot "water-log." Sizes from 250 to 3000 g.p.h. Gas engine drive if desired.

Westco Deep-well Turbine Pumps

Ideal for supplying adequate volumes of water to large farms, estates, schools, dairies, industrial plants, etc.

High efficiency at low operating speeds.

No water-thrust or whip in shaft.

Either oil or water lubrication.

Bronze-fitted construction.

Stainless steel Impeller shaft.

Where 20 to 200 g.p.m. is desired, Westco does the job with 1 or 2 Impellers where other makes would require 6 or 8 Impellers.

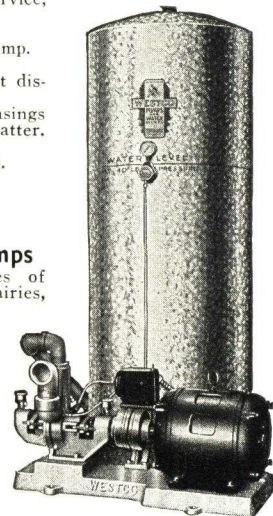
Sizes from 20 to 200 g.p.m. against heads up to 500 ft.

Direct motor or belt drive.

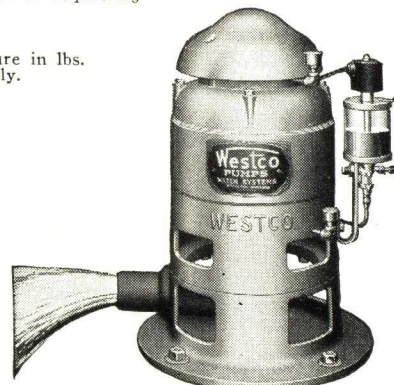
Detailed Information

Certified blue prints, Architect's Specifications, Performance and Selection Tables gladly sent upon request. When requesting prices, please give:

- (1) Kind of liquid.
- (2) Gallons per minute.
- (3) Head in ft. or pressure in lbs.
- (4) Source of liquid supply.
- (5) Power available.



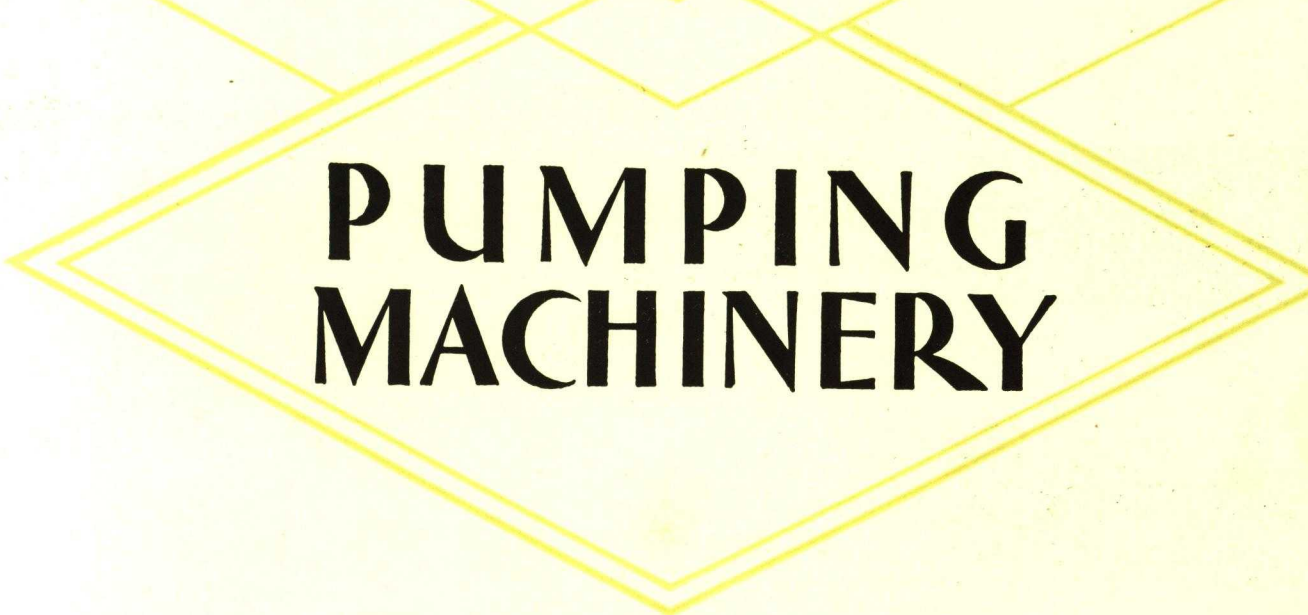
Westco Automatic Water System



Westco Deep-well Turbine Pump



WARREN



**PUMPING
MACHINERY**

WARREN STEAM PUMP COMPANY, INC. • WARREN, MASS.

• FOREWORD •

Warren specializes in the manufacture of fine pumps *exclusively*. It has consistently done so for the past 30 years.

The Warren policy is to design and build pumps that will insure their users the lowest possible pumping cost per year for the particular pumping job required. The Warren Centrifugal and Reciprocating Pumps described on the following pages are indicative of this policy.

Further, it is part of the Warren policy to "Build the Pump to Fit the Job." Should there be some pump size, capacity or condition which you seek particularly and which you fail to find mentioned in the following descriptions of standard Warren Pumps, this does not mean that the exceptional advantages of Warren Pumps must be denied your plant. For Warren is fully equipped, both by experience and facilities, to make special pump combinations, to design and build, whenever necessary, such special units as may deviate from standard practice—no matter how slight or how great that deviation might be.

Because Warren considers every pumping job as a separate engineering problem, Warren engineers are always available to you for studies and recommendations to meet your individual pumping needs . . . to insure your plant of the utmost efficiency and economy from every pumping installation. Feel free to call upon this Warren service at any time.

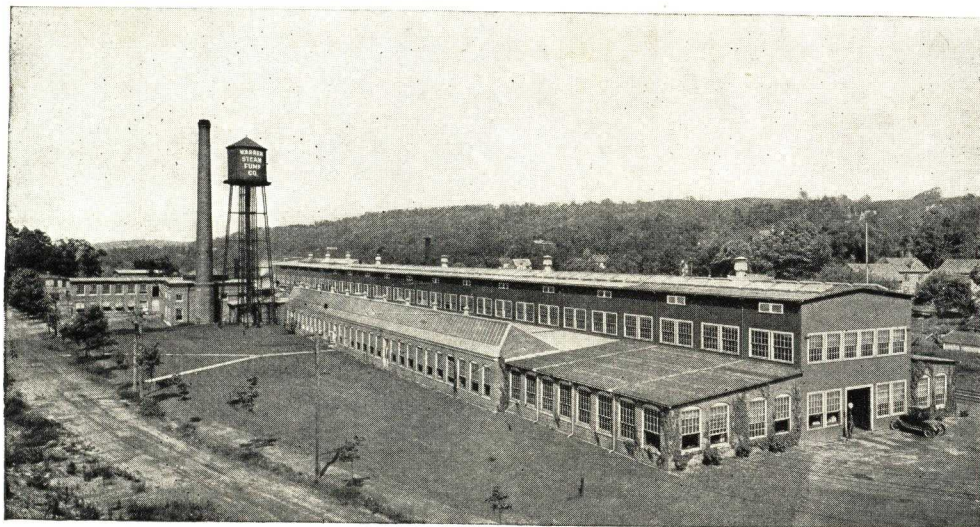
WARREN STEAM PUMP COMPANY, Inc. WARREN, MASS.

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OFFICES AND AGENCIES

ATLANTA, GA.	Rittelmeyer & Co.
BOSTON, MASS.	Warren Steam Pump Company, Inc.
CHARLOTTE, N. C.	J. H. Trescot
CHICAGO, ILL.	Warren Steam Pump Company, Inc.
CINCINNATI, OHIO	Henry C. Hill
CLEVELAND, OHIO	H. W. Kaiser Co.
DETROIT, MICH.	Garrett Burgess, Inc.
HOUSTON, TEX.	The Tennant Company
LOS ANGELES, CAL.	Kimball-Krogh Pump Co.
NEW ORLEANS, LA.	Gulf Engineering Service & Specialty Co.
NEW YORK, N. Y.	Vincent-Gilson Engr. Co. (other than marine) Warren Engineering Corp. (marine only)
OKLAHOMA CITY, OKLA.	Ed. Trammell Pump & Machinery Co.
PHILADELPHIA, PA.	Warren Steam Pump Company, Inc.
PITTSBURGH, PA.	F. W. Smith
ST. LOUIS, MO.	Fred W. Ryder
ST. PAUL, MINN.	Robinson, Cary & Sands Co.
SAN FRANCISCO, CAL.	Western Engineering Co.
SCRANTON, PA.	The Whitmore Company
SEATTLE, WASH.	R. L. Dyer



• THE WARREN COMPANY • ITS HISTORY • • ITS EXPERIENCE • ITS FACILITIES •

The WARREN STEAM PUMP COMPANY, INC., of today had its beginning back in '97. An humble wooden building then housed the hopes, the ideals, the resources, the facilities of the new company. Reciprocating pumps were the sole products. But into the production of these went all the skill that the brains and brawn of the plant could muster. From the beginning—even as it is today—the company policy was to make no compromise with quality, but always to build and send forth on its mission a pump completely worthy of the name of Warren. To this end, constant research, incessant experimentation and development work were carried on.

The growth of the company's reputation for fine pumps and for fair dealings was rapid . . . and with it came an ever-increasing demand for Warren pumps. In 1924 the company went into the production of a complete line of centrifugal pumps as companion products to reciprocating pumps.

Naturally, expansion of plant and facilities became necessary as the scope of Warren pump distribution grew nation-wide. Replacement was made of all original buildings and equipment with those of the most modern construction and advantages. The main shop alone is 540 ft. long and is served by two giant electric traveling cranes. Facilities for manufacturing Warren Pumps, standard or special, are modern and fully adequate for every need. Obsolescent machinery, tools and methods have no place in the Warren plant to hinder production, heighten costs or hazard quality. Testing equipment, for example, includes three large tanks. The largest, 80 ft. long by 30 ft. wide, contains 110,000 gals. of water and has been used to test pumps with capacities up to 29,000 gals. per minute.

As it has done for hundreds of others, a Warren proposal will definitely demonstrate the worth of Warren history, experience and facilities as applied to *your* present or future pumping needs.



GUARANTEE

All Warren Pumps are guaranteed against defects in either material or workmanship for a period of one year from date of shipment. Any part proving defective from either cause in that time will be replaced without charge, f.o.b. our Works, provided the purchaser gives us immediate notice in writing of such defect and will deliver to our Works, transportation charges pre-paid, the defective part or parts.

WARREN MULTI-STAGE BALANCED TYPE CENTRIFUGAL PUMPS

Warren Multi-Stage Centrifugal Pumps typify the results of Warren engineering ability, manufacturing skill and experience in building pumps that combine high efficiency, lasting dependability and minimum maintenance.

All parts are of the finest, extra heavy materials and the quality of workmanship is in complete keeping with Warren standards. Each Warren Multi-Stage Pump of the opposed impeller type is hydraulically balanced, which means that the design and arrangement of the impellers is such that end thrust is reduced to a minimum. (See Fig. 1.)

Note that the high pressure stuffing box has to be packed against the pressure of the first stage only. Other multi-stage pumps are balanced by the use of a balancing drum. (See Fig. 2.)

Quick, easy accessibility to all interior parts is possible without disturbing piping connections. Easily replaceable protecting pieces are provided for all parts subject to wear. There is but one joint in the casing.

Available for a wide range of uses and, where necessary, built to fit the job, all Warren Multi-Stage Pumps can be arranged for belt drive, or direct connection to motor or turbine.

SPECIFICATIONS

Pump Casing

Of the volute type, correctly proportioned with easy curvature and liberal area.

Made of cast iron, casing consists of two parts, separated on horizontal plane.

Lower half contains both suction and discharge openings.

Top half, or case cover, readily raised for inspection of impellers and all interior parts.

Removal of bearing caps and case cover permits the rotating member to be removed without disturbing piping connections or other parts.

Impellers

Of the enclosed type, and made of special high grade bronze.

The outside surface is carefully machine-finished, with interior passages chipped and filed for smoothness.

Accurately fitted and keyed to shaft and firmly secured by lock nuts which form part of shaft sleeves.

Protecting Rings

Pump casing and impellers provided with removable protecting rings. On the casing, these rings are securely held in place by tongue and groove joints; on impellers, by right and left hand threads. In smaller sizes of pumps, up to and including the 3-inch size, removable rings are not furnished on impellers.

Bearings

Cast iron, of the bracket type, and bolted securely to the bottom half of pump casing. Brackets provided with removable covers and fitted with removable cast iron split shell, genuine babbit lined, ring oiling bushings. Multi-collar marine type thrust bearing, supporting bracket of which is provided with jacket for water-cooling the lubricant. Water-cooled thrust bearing of the ball type or Kingsbury thrust bearings can be furnished.

Shaft

Of high carbon, open-hearth steel turned straight and true throughout its entire length and finished by grinding on dead centers, thus insuring perfect alignment, accurate dimensions and high finish. Shaft is of ample diameter to transmit required power safely without undue bending or twisting.

Shaft Sleeves

To protect shaft from corrosion and wear, bronze sleeves are provided and extend through stuffing boxes.

Packing Glands

Of split type and easily accessible. Can be removed without disturbing other parts. Stuffing boxes are extra deep, arranged for metallic or soft packing, and provided with water seals, all necessary drip boxes and drainage openings.

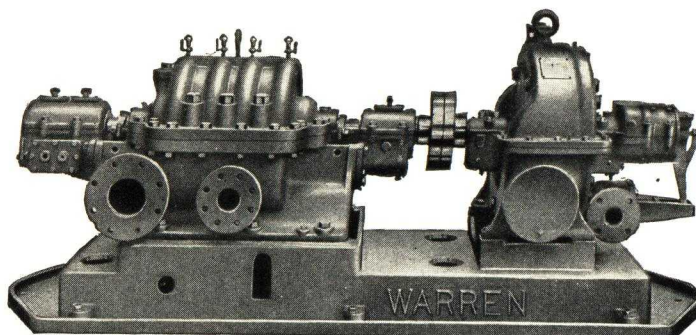


Fig. 241—Warren Four-Stage Balanced Type Centrifugal Pump with Turbine Drive

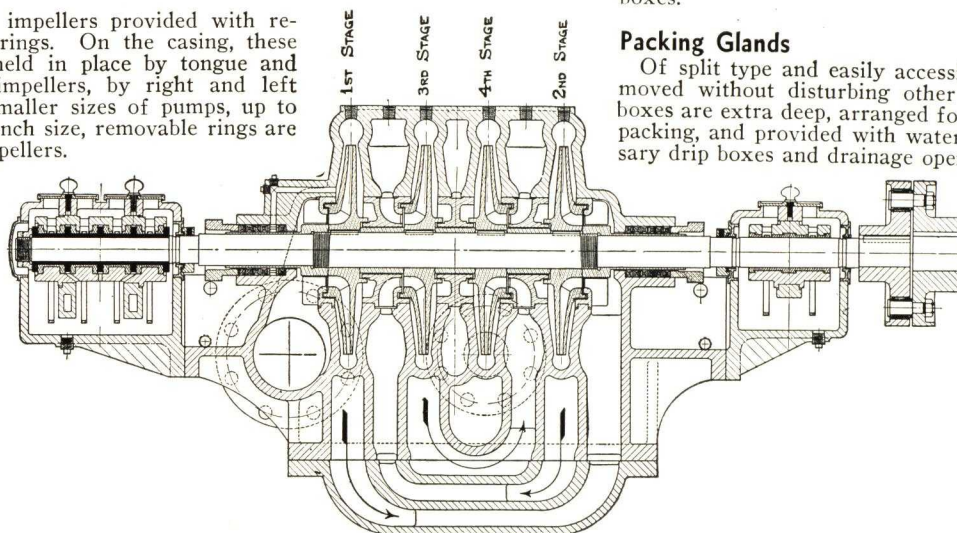


Fig. 1—Cross Section Diagram of 4-Stage Pump, Showing Arrangement of Water Passages to Reduce End Thrust

Base Plate

Of the box type and one-piece cast iron construction. Provided with faced pads for mounting pump and prime mover.

Coupling

Made of cast iron or steel, of the flexible, steel pin, rubber buffer type or other approved equal.

Equipment, Painting, Etc.

Eyebolts for lifting pump case cover, and special wrenches required for removal of certain pump parts are regularly furnished. Before shipment, exterior surfaces of pump and base plate are given two coats of filler, rubbed smooth and finished with one coat of machinery paint.

Note: In writing to us, your interests will be best served if information of the type listed on page 5 is given.

Testing

Each pump is put through a running test to verify performance guarantees. Customers are welcomed as witnesses to this test. Casing is subjected to hydrostatic test pressure of *at least* 50% in excess of maximum working pressure—a test that will readily reveal the slightest sign of leakage or weakness.

Engineering Service

Warren engineers are ready to co-operate with you to the fullest extent in order to ensure you of getting the right pump for the job at hand. A proposal by Warren is a guarantee—never a compromise—that the pump will meet the customer's individual requirements.

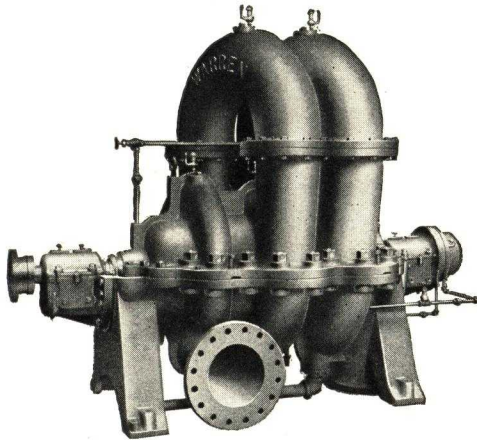


Fig. 325—12-Inch, 3-Stage Balanced Type Centrifugal Pump

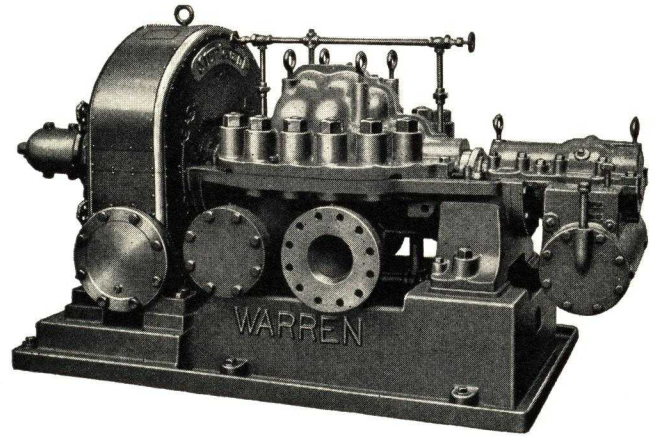


Fig. 319—5-Inch, 3-Stage, Close Coupled, Turbine-Driven, Balanced Type Centrifugal Pump

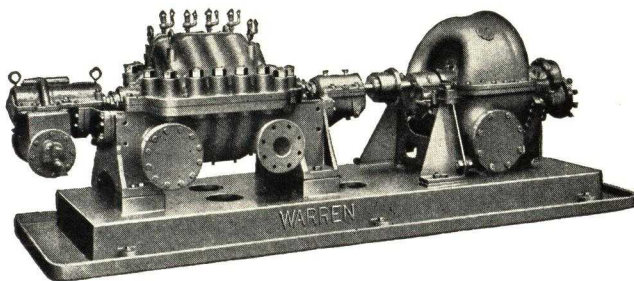


Fig. 285—4-Inch, 5-Stage Centrifugal Feed Pump

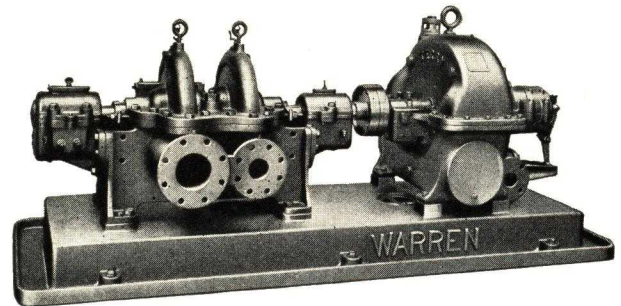


Fig. 248—3-Inch, 2-Stage Double Suction Centrifugal Pump

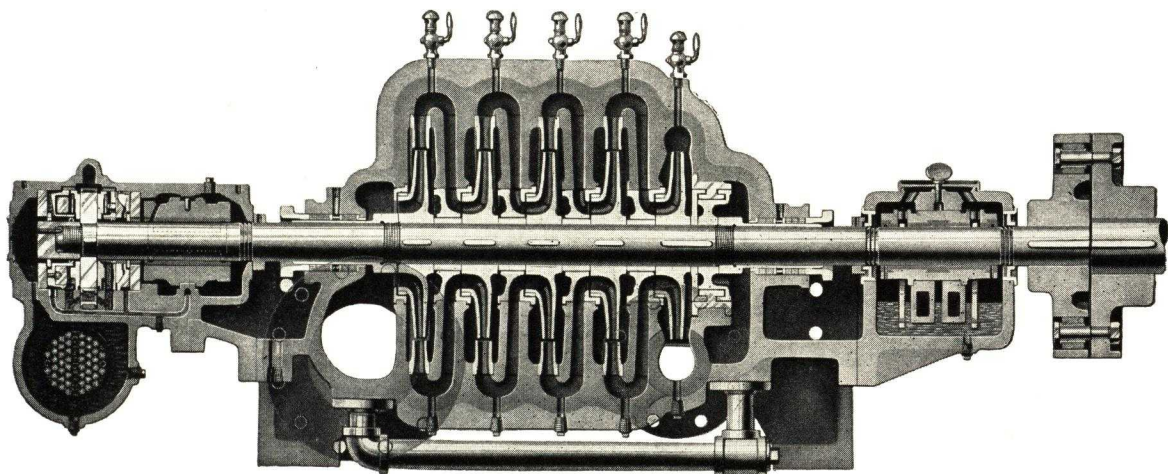


Fig. 2—Sectional View of a Warren 4-Inch, 5-Stage Boiler Feed Pump

WARREN SINGLE-STAGE DOUBLE-SUCTION CENTRIFUGAL PUMPS

These pumps, like all Warren pumps, are designed and built upon sound engineering principles. As such, you may be sure that those essentials of completely satisfactory service—efficiency, dependability, minimum maintenance, slow depreciation, and lowest possible pumping cost per year for the pumping job required—have been built into these pumps in as great a measure as possible. *How great*, may be readily determined by careful consideration of Warren Single-Stage, Double-Suction

Centrifugal Pumps. They include those all-important mechanical factors upon which a careful selection of centrifugal pumps should be based.

We ask that you study these points . . . realize their true significance . . . compare them point by point with pumps of a similar nature . . . and thus find conclusive proof that in the design and construction of the Warren pump there is never a compromise on quality, but always a guarantee of the service, the satisfaction, the security, you seek.

IMPORTANT FEATURES AND GENERAL CONSTRUCTION

Bearing Seal

A good bearing seal should prevent escape of oil and entrance of water to bearing, as well as keep out dirt and dust. In the Warren pump, tapered grooves in the shaft throw the oil back towards the reservoir. A slinger fastened to the shaft and fitted over a projection on the end cover effectively stops the travel of water into the reservoir.

Oil Reservoir

The oil reservoirs on Warren Centrifugal Pumps are extra large and, in connection with the effective oil seal, make frequent oilings unnecessary.

Shaft

It is important to note the size of the shaft at impeller and bearings. The shafts in Warren Centrifugal Pumps are extra large, preventing vibration and deflection. Warren shafts are made of open hearth high carbon steel with a tensile strength of 90,000/110,000 lbs. per sq. in.

Impellers and Sleeves

All impellers and sleeves for Warren pumps are of heavy design, and cast from the highest grade of bronze.

Weight

You want the weight in the pump where the work is performed, and not in the baseplate. Warren pumps have heavy bronze impellers and thick iron casings.

Thrust Collars

The thrust collars for all Warren pumps are designed with a very liberal carrying capacity. They are shouldered and keyed to the shaft and securely held in place by a flanged lock nut.

Bearings

Long split bearings of large diameter such as are in Warren Centrifugal Pumps, reduce the load per square inch of bearing surface, prevent bearing troubles and have unusually long life.

Glands

The glands of Warren Pumps are made of bronze, split, with halves bolted together. Their heavy construction prevents bending of the ears.

Clearances

The clearance between impeller rings and case rings in Warren Centrifugal Pumps is liberal, ranging from .015 in. to .030 in. This means that Warren Pumps do not obtain their efficiencies by close clearances, only to lose them after the pump has been in operation a short time. Many pumps rely upon close clearances to obtain their high shop test efficiencies, but rapid wear on the rings causes a noticeable drop in efficiency shortly after the pumps are put in service. Warren Pumps, with liberal clearances, maintain their original efficiencies over long periods.

General Construction

Warren Centrifugal Pumps are designed to permit disassembly and inspection of all parts without disturbing suction or discharge pipe connections. Top half or pump case cover is easily raised, rendering impeller and all interior parts accessible. By removing bearing caps, rotating member may be lifted out without disturbing pipe connections or other parts of machine. Pump can be readily taken apart and assembled by unskilled attendants without use of special tools.

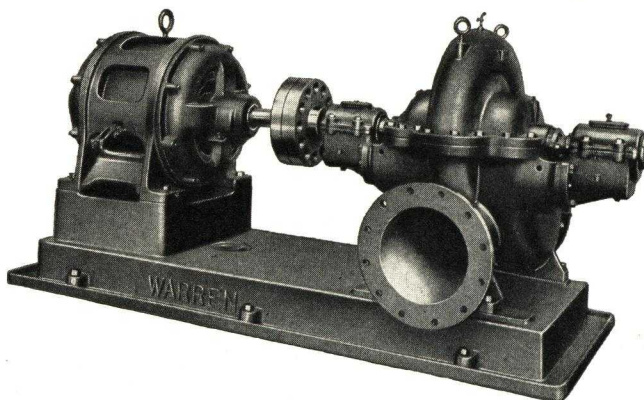


Fig. 249
14-Inch, Single-Stage Double-Suction Pump

Long life and the maintenance of maximum efficiency with minimum expense for repairs are insured by providing parts subjected to wear with easily replaceable protecting pieces, which are all manufactured on limit gauge, interchangeable basis.

Warren Single-Stage, Double-Suction Centrifugal Pumps are built for speeds up to 3600 r.p.m. Each pump must pass exacting performance tests before shipment. Performance guarantees are verified by these tests and the customer is cordially invited to witness them.

For a Warren Recommendation . . .

Get in touch with a Warren Agent or write us. Your interests may best be served if care is taken to give us full information on such pertinent points as:

1. Kind of liquid to be pumped (and whether hot or cold, clear or gritty).
2. Height to which liquid will be lifted by suction; length and diameter of suction pipe and number of elbows.
3. Height, or against what pressure, liquid will be pumped; length and diameter of discharge pipe and number of elbows.
4. Maximum number of gallons to be pumped, per minute or hour.
5. Type of prime mover (belt, motor or turbine). If turbine or steam engine, give us steam pressure, etc. If electric motor give current characteristics.

. . . **and remember**, that a Warren recommendation is *never* a compromise, *always* a guarantee that a Warren Pump will do the job at the lowest possible pumping cost per year for the particular pumping job required.

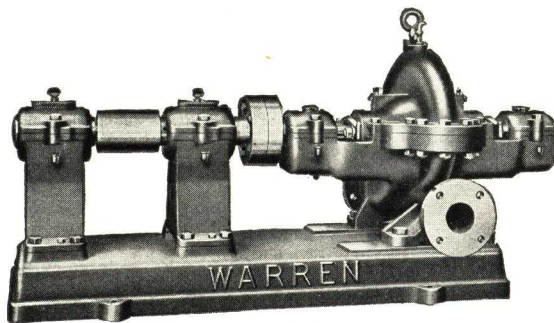


Fig. 233
3-Inch, Single-Stage Double-Suction, Belt Drive

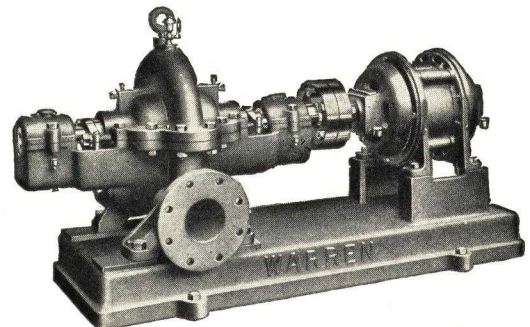


Fig. 225
4-Inch, Single-Stage, Double-Suction, Motor Drive

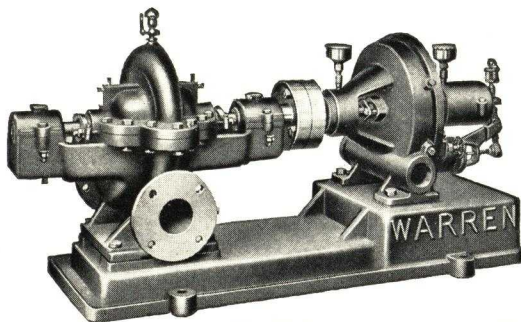
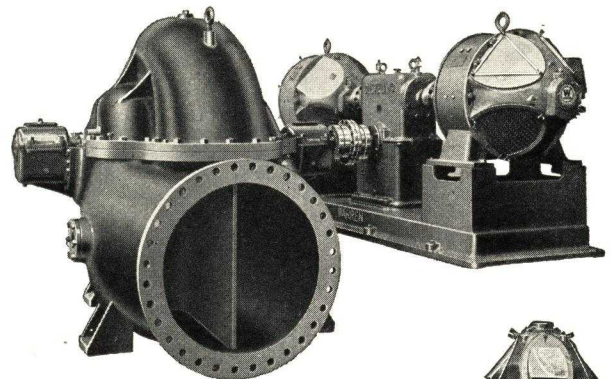


Fig. 226
3-Inch, Single-Stage, Double-Suction, Turbine Drive



Above:

Fig. 312—30-Inch, Single-Stage, Double-Suction Pump, Motor Driven Through Reduction Gears

Right:

Fig. 323—2-Inch, Vertical, Single-Stage Condensate Pump

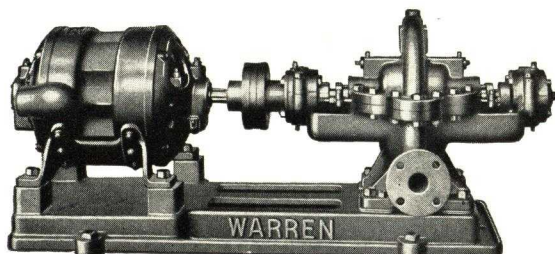
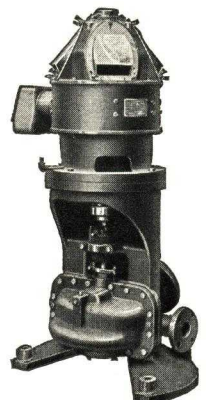


Fig. 255
1½-Inch, Single-Stage, Double-Suction, Motor Drive



WARREN SINGLE-STAGE CENTRIFUGAL STOCK PUMPS

For Handling Pulped Stocks in the Paper Mill Industries . . .

Nowhere is the demand for modern, dependable, efficient pumps greater than in the paper manufacturing industry. Progress in this field has demanded the handling of higher consistency stocks, greater capacities, higher efficiencies and freedom from shut-downs. Warren Centrifugal Stock Pumps have been notably successful in meeting these demands.

Since the initial installation in 1924, the superiority of Warren Stock Pumps in handling pulp and paper mill requirements has been popularly con-

ceded. Proof that Warren design and construction have met with the unqualified approval of paper mill authorities . . . proof that in actual operation the pumps are living up to efficiency and economy claims . . . is reflected in the continual adoption of Warren Stock Pumps by concerns that are satisfied with nothing but the best. Perhaps no stronger evidence need be offered than the fact that *70% of the purchasers of Warren Centrifugal Stock Pumps have placed repeat orders, and others have stated their intentions of so doing!*

EACH INSTALLATION CONSIDERED A SEPARATE ENGINEERING PROBLEM

The recent progress in paper mill practice has meant much pioneer work in stock pump design, and it is acknowledged that many of the stock handling problems cannot be met by the use of standardized stock pumps. That is why it is the policy of the Warren Company to consider each stock pump job as a separate engineering problem . . . to treat each installation as a distinctly separate and individual job . . . to take all factors into consideration . . . and then make recommenda-

tions only on the basis of the correct pump for the job.

The extensive experience of our Engineering Department in pulp and paper mill pump installations becomes especially valuable to those considering new methods or new equipment. Warren Engineers are immediately available to assist in working out a satisfactory solution to any pumping problem and will gladly prepare recommendations for your particular requirements on request.

GENERAL DESCRIPTION

Design

Warren Centrifugal Stock Pumps are successful because back of them is correct design. Warren design is the result of actual studies and field experiments in handling stocks of various kinds and consistencies in many paper mills.

It is fundamental that if the maximum of successful operation is to be obtained, the design of one part must bear the proper relation to the design of another. In a pump, this means that both hydraulic and mechanical details must be carefully analyzed. The velocity of the liquid must be kept, at all times, within such bounds as

experience has shown to give the best results, and all parts must be proportioned to stand up under the severe service encountered in pulp and paper mill practice.

To fully appreciate Warren design, examine the sectional view of the pump at the top of the following page.

Note the extra heavy, non-vibrating, non-deflecting shaft . . . the heavy bearings mounted in a substantial unit pedestal that insures perfect alignment . . . the easily *renewable* liners . . . the liberal stuffing boxes . . . the distinctly Warren design of impeller. These are the fine points, the distinguishing features that re-

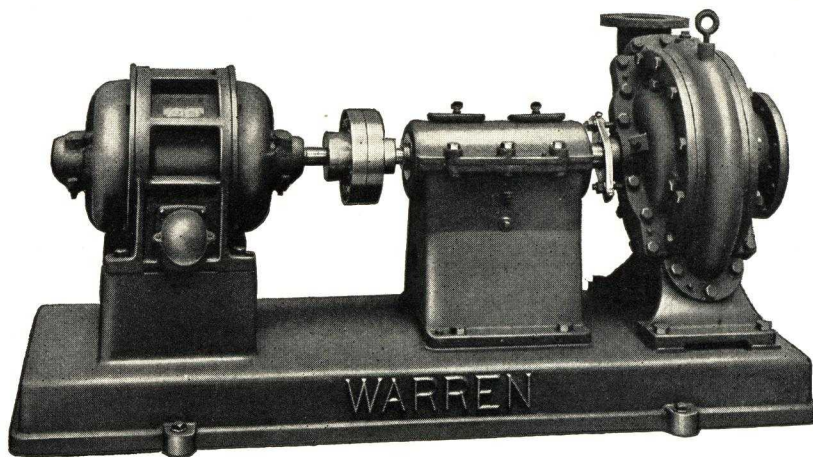


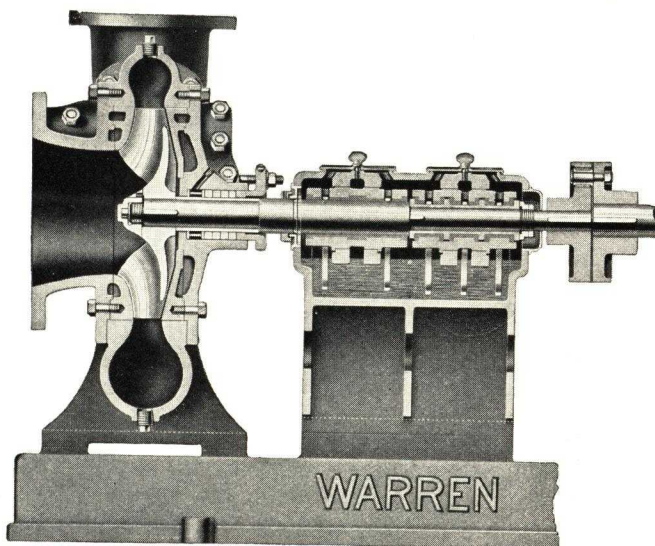
Fig. 228—5-Inch, Single-Stage Stock Pump

veal why Warren Stock Pumps will handle 6% stock smoothly, efficiently, without clogging or binding . . . why, for example, in an Eastern Mill, a Warren Pump economically fills a 1400-lb. beater with 5% kraft stock in 1 minute and 20 seconds!

Impellers

Wide Variety Available—The impeller is the heart of the pump. Consequently, to the design and operation of the Warren Impeller has been brought all the wide and varied experience of Warren Engineers in handling solids in suspension. Warren Impellers are not limited to a standardized line, nor to any fixed number of blades. Research and experiment revealed that a wide and varied line of impellers was necessary because operating conditions may require an impeller of different design from that in a pump handling identical stock, but under different conditions.

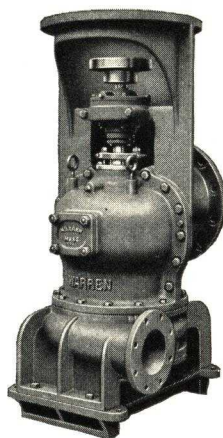
Self-Cleaning and Non-Binding—Shut-downs due to clogging . . . caused by stock working back of pump impellers, there to pack tight and bind the pump . . . have been eliminated because of Warren Impellers. Warren Engineers, after several years of experimentation work and testing, have so designed Warren Impellers as to make them self-cleaning and non-binding . . . an invaluable time, trouble and cost-saving feature. Used in mills where stock handling conditions are severe, Warren Stock Pumps equipped with the new type of impeller are giving uninterrupted service day in and day



Sectional View of Warren Centrifugal Stock Pump Arranged for Direct Drive

ness of design. One without the other would be worthless.

To ensure the efficiency of the pump throughout, all materials are of first quality and carefully selected. Both materials and workmanship are subjected to rigid inspection and tests.



Special Warren Vertical Stock Pump

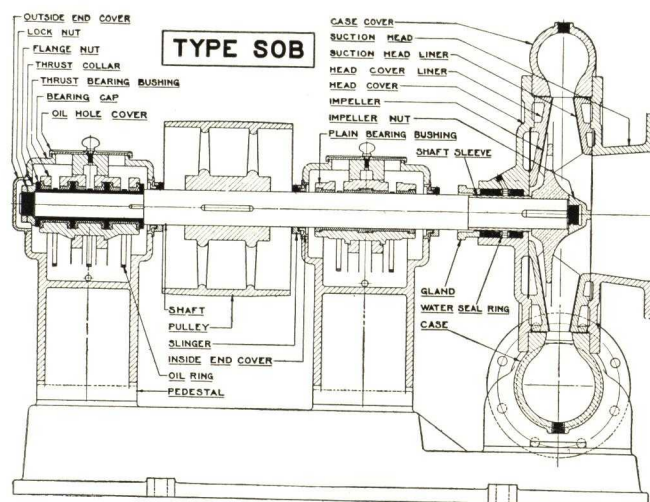
Special Warren Vertical Stock Pump

This pump will handle heavy or thin stocks, low, medium or high head service. Intended primarily for installations where the suction submergence is low. Large top suction eliminates air-binding.

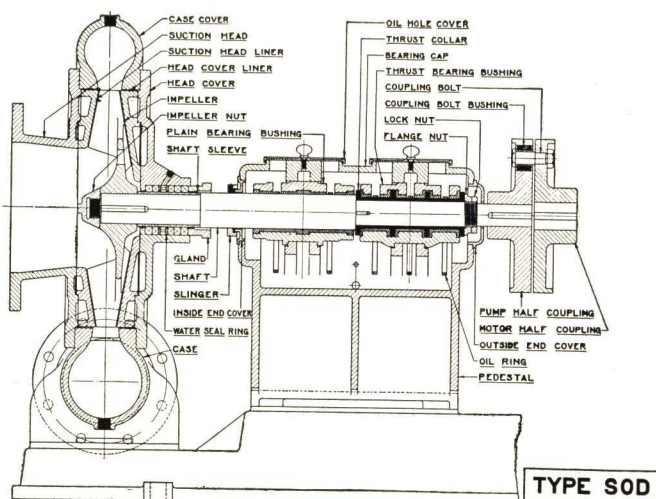
For conditions where the suction pipe may be uncovered, we usually recommend this pump.

With a vertical pump, it does not matter whether the suction pipe is uncovered or not, for as long as the stock flows onto the impeller, it will discharge same.

Note: Stock friction tables will be gladly sent on request to interested parties.



Type SOB—Belt Driven Centrifugal Stock Pump



Type SOD—Direct Connection Centrifugal Stock Pump

WARREN STEAM HEAT VACUUM PUMPS

The Warren line of Steam Heat Vacuum Pumps is a further example of the Warren policy of designing, building and testing its pumps to insure complete dependability, maximum operating efficiency and minimum maintenance over the longest possible period. The design has stood the test of time and stress of service. Their widespread use on various heating systems reflects their ability to give the long, efficient, trouble-free service that pumps of this nature should be built to give.

Designed to maintain a vacuum in and drain steam coils, radiators, etc., on heating and drying systems, Warren Vacuum Pumps insure positive circulation of the steam throughout the system and relieve back pressure on the engine or other apparatus from which the exhaust steam is utilized, discharging the drainage into a tank or heater. Because they insure the vaporization of the steam until it is reduced to a temperature below that of

the vacuum, these pumps, applied to a heating system, definitely insure a notable increase in the efficiency of the exhaust steam.

Warren Steam Heat Vacuum Pumps are designed to operate on ordinary steam pressures. The capacity ratings given in the tables below are intended to represent the amount of radiating surface that these pumps will serve when running at a conservative piston speed, under ordinary conditions of installation and service. Where conditions are unusual, we would recommend that before determining upon any of the sizes listed in the tables below, we be advised regarding the existing conditions under which the pump would be required to operate. Further, Warren Engineers will gladly co-operate with you in working out the most economical solution to the pumping problem at hand.

Note: Cast iron pans for use with Warren Vacuum Pumps can be furnished, if desired, at small additional cost.

SPECIFICATIONS

Valve Motion—Obtained by use of the Warren "Eclipse" patented valve gear.

Steam Piston—Of the snap ring type.

Water Cylinder, Valve Chest, Cover, and Cylinder Head—Made of cast iron.

Water Cylinder Lining—Made of heavy seamless brass tube or rolled sheet.

Water Piston—Made of cast iron, of the non-adjustable type, with bronze stud and nuts. Bronze piston furnished at slight extra cost.

Valve Seats, Stems, Guards, Nuts and Springs—Made of bronze.

Valves—Made of phosphor bronze of multi-disc type.

Piston Rod—Made of sturdy rolled bronze.

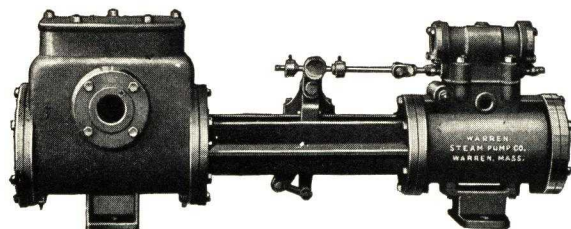


Fig. 174—Size 8x10x12

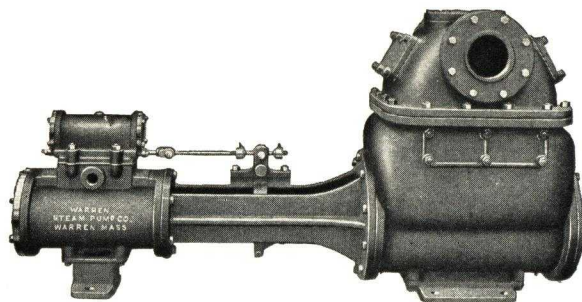


Fig. 158—Size 10x16x18

DIMENSIONS OF PUMP TYPES INDICATED BY FIG. 174

Size	Steam	Exhaust	Suction	Discharge	Sq. ft. direct heating surface drained	Piston speed ft. per min.	Single strokes per min.	Code word
4 x 5 x 5	1/2	3/4	2	1 1/2	4,760	34	82	Vacone
4 x 6 x 7	1/2	3/4	2 1/2	2	8,070	40	69	Vactwo
5 1/2 x 8 x 7	3/4	1	3	2 1/2	14,300	40	69	Vacthree
6 x 8 x 12	3/4	1	3 1/2	3	19,210	54	54	Vacfour
6 x 10 x 12	3/4	1	4	3 1/2	30,040	54	54	Vacsix
8 x 10 x 12	1	1 1/4	4	3 1/2	30,040	54	54	Vacare
8 x 12 x 12	1	1 1/4	5	4	43,200	54	54	Vacall
10 x 14 x 12	1 1/4	1 1/2	6	5	58,900	54	54	Vaccur

DIMENSIONS OF PUMP TYPES INDICATED BY FIG. 158

10 x 14 x 18	1 1/4	1 1/2	8	6	88,300	81	54	Vacaa
10 x 16 x 18	1 1/4	1 1/2	8	6	115,300	81	54	Vacab
12 x 18 x 18	2	2 1/2	8	8	145,000	81	54	Vacac
12 x 18 x 24	2	2 1/2	8	8	160,000	90	45	Vacad
14 x 20 x 24	2	2 1/2	9	8	201,000	90	45	Vacae

WARREN HORIZONTAL SINGLE PISTON PUMPS

For Boiler Feed or Pressure Service . . . Tank or Light Pressure

Similar in purpose to the Warren Vertical Single Piston Pumps described on the following page, but recommended where space limitations are not a deciding factor. Warren Horizontal Single Piston Pumps are made in a variety of sizes and types and are adaptable to a wide range of services and operating conditions.

Their wide acceptance and record for "repeat" orders can be traced not only to their dependability and durability in service, but also to their insurance of a maximum of pumping service at a minimum pumping cost per year. Back of these features, of course, are the sound design, quality materials and skilled workmanship which, as the Warren standard, enter into these pumps and provide the strength and rigidity that preserves alignment no

matter how great the stress and strain of operating conditions.

As in the construction of the Vertical Single Piston Pumps, every pump of the Horizontal class is fitted with the patented Warren "Eclipse" Valve Gear, which, as described on the following page, effects considerable economy in steam consumption and, by causing the pump to slow down gradually, saves wear and tear on valves in their seating operation.

As regularly furnished, these pumps are equipped with brass liners in the pump cylinders, as well as brass pump pistons, valve seats and valve fittings. Valves can be furnished of either hard or medium rubber, as preferred.

Can be built to operate on super-heated steam.

FOR BOILER FEED OR PRESSURE SERVICE

Size, inches			Gals. per stroke	Max. capacity per min.			H.P. boiler pump will feed at slow speed, 34.5 lbs. per H. P. H.	Code word
Steam cylinder	Water cylinder	Stroke		No. single strokes	Ft. piston speed	Gallons		
4	2½	5	.10	58	24	5.8	84	Keating
5½	3¾	7	.33	44	26	14.5	210	Knight
7	4	7	.38	44	26	16.7	242	Knightly
7	4½	10	.69	46	38	31.74	460	Keen
7½	5	10	.85	46	38	39.1	566	Keenly
8	5	12	1.02	40	40	40.8	591	Katzer
10	6	12	1.47	40	40	58.8	852	Keep
12	7	12	2.00	40	40	80.0	1,160	Keepwell
14	8	12	2.61	40	40	104.4	1,513	Keepsake
16	10	16	5.44	38	50	206.7	2,996	Kaffir
18	12	24	11.75	32	64	376.0	5,450	Konite

FOR TANK OR LIGHT PRESSURE SERVICE

4	4	5	.27	82	34	22.14	Kid
5½	5½	7	.72	69	40	49.68	Kiddest
6	6	12	1.47	54	54	79.38	Kettle
7	7	12	2.00	54	54	108.0	Kentif
7½	7½	10	1.91	62	52	118.42	Kidwell
8	8	12	2.61	54	54	140.94	Kerchief
8	10	12	4.08	54	54	220.32	Keyhole
10	10	12	4.08	54	54	220.32	Kangaroo
10	12	12	5.87	54	54	316.98	Kidnap
10	12	18	8.81	54	81	475.74	Killer
12	12	12	5.87	54	54	316.98	King
12	12	18	8.81	54	81	475.74	Kingfish
12	14	12	8.00	54	54	432.0	Kink
12	14	18	12.00	54	81	648.0	Kingworth
14	14	12	8.00	54	54	432.0	Kip
14	14	18	12.00	54	81	648.0	Kipper
14	16	18	15.66	54	81	845.64	Knobby
14	18	18	18.83	54	81	1,016.82	Knob
14	18	24	26.44	45	90	1,190.0	Kag
16	18	24	26.44	45	90	1,190.0	Kagger

Essential Information Needed for Proposals . . .

The Warren Engineering Department is always glad to serve in an advisory capacity to those having pumping problems of an unusual or difficult nature. In writing to us, your interests will be better served if full information is given on such points as the following:

1. Kind of liquid to be pumped and whether hot or cold, clear or gritty.
2. Height to which liquid will be lifted by suction; length and diameter of suction pipe and number of elbows.
3. Height, or against what pressure, liquid will be pumped; length and diameter of discharge pipe and number of elbows.
4. Maximum number of gallons to be pumped per minute or per hour; or boiler horsepower to be fed.
5. Lowest steam pressure available at pump.
6. Will steam exhaust into atmosphere, into a condenser, or against back pressure? If the last, how much?

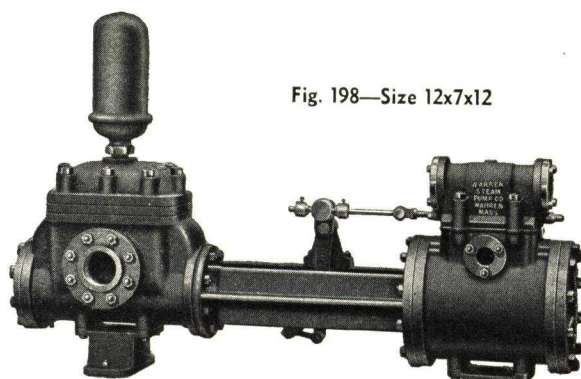


Fig. 198—Size 12x7x12

Cast-centerpiece Type

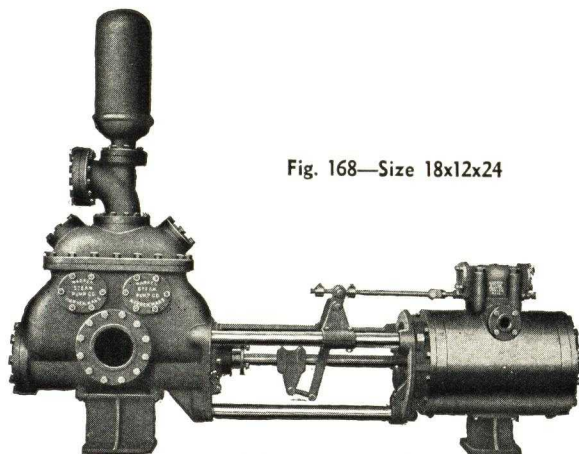


Fig. 168—Size 18x12x24

Tie-rod Centerpiece Type

WARREN VERTICAL SINGLE PISTON PUMPS

For Boiler Feed or Pressure Service . . . Tank or Light Pressure

Available for the services and in the sizes noted in the tables below, Warren Vertical Single Piston Pumps are a logical choice wherever economy of steam consumption and space restrictions are factors to be taken into consideration. Designed primarily for marine or naval service, their performance records have led to their adoption in increasing number by engineers for stationary installations as well.

In their design and construction, nothing has been left undone to insure a sturdy, exceptionally efficient and economical line of pumps. The pistons move in a vertical plane, thus providing for equal wear on all surfaces of the cylinder walls . . . a feature to be considered in comparison with some horizontal pumps in which the weight of the pistons tends to cause wear on the lower side of the cylinder wall only.

An especially desirable feature is that all pumps of this type are fitted with the patented Warren

"Eclipse" Valve Gear. Among the advantages of this valve gear is that it cuts off the steam toward the latter part of the stroke, at which time the requirements for steam are not as great as at reversal.

This allows the pump to utilize the vast expansive force of the steam, and serves also to allow the pump to slow down gradually and thus permit the valves to seat easily and without shock.

Piston rods in pumps having strokes of 6 in. and shorter are of the one-piece type and made of rolled bronze. In all other pumps, of the two-piece type, the steam end rod is made of steel and the pump end rod of rolled bronze.

Pump ends are lined with brass, and valve seats and valve fittings are also of brass. For marine and special service, pump ends can be furnished made entirely of bronze.

Can be built to operate on super-heated steam.

FOR BOILER FEED OR PRESSURE SERVICE

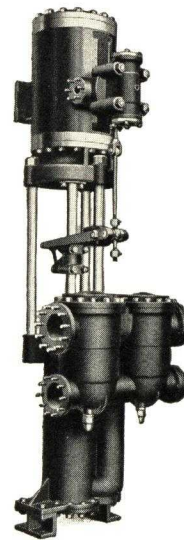
Size			Capacity				Boiler H.P. will feed	Code word
Steam cylinder	Pump cylinder	Stroke	Gals. per stroke	Strokes per min.	Ft. piston speed	Total G. P. M.		
3½	2¼	4	.07	66	22	4.62	67	Wad
4½	2½	6	.13	52	26	6.76	98	Wafer
5½	3½	6	.25	52	26	13.0	188	Waft
6	4	8	.43	45	30	19.35	280	Wag
8	5	12	1.02	40	40	40.8	591	Weak
9	6	12	1.47	40	40	58.8	852	Weal
10	6	12	1.47	40	40	58.8	852	Wealthy
10	7	12	2.00	40	40	80.0	1,160	Wear
12	7	12	2.00	40	40	80.0	1,160	Wearily
12	8	12	2.61	40	40	104.4	1,513.	Weasel

Long Stroke Type

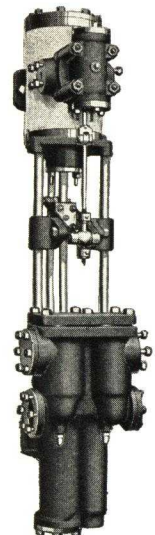
6½	4½	12	.82	40	40	32.8	475	Wicked
9	6	16	1.96	38	50	74.5	1,078	Wide
10	6	18	2.19	40	60	88.1	1,278	Widel
10	6	24	2.94	32	64	94.0	1,362	Widely
10	7	18	2.99	40	60	119.6	1,734	Wife
10	7	24	4.00	32	64	128.0	1,855	Wifely
12	8	18	3.92	40	60	158.8	2,272	Wild
12	8	24	5.22	32	64	167.0	2,420	Wildcat
13	9	16	4.41	38	50	167.6	2,430	Wince
14	9	24	6.61	32	64	211.5	3,065	Windage
14	10	24	8.16	32	64	261.2	3,785	Window
15	10	16	5.44	38	50	206.7	2,995	Wire
15	10	24	8.16	32	64	261.2	3,785	Wireless
16	10½	24	8.99	32	64	287.7	4,170	Wiry
16	12	24	11.75	32	64	376.0	5,450	Wisdom

FOR TANK OR LIGHT PRESSURE SERVICE

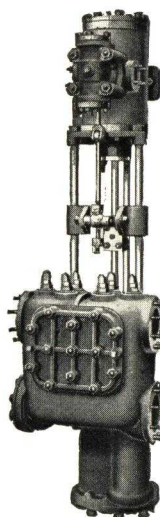
3½	4	4	.22	90	30	19.8	.....	Woe
4½	5	6	.51	80	40	40.8	.....	Wolfish
4½	6	6	.73	80	40	58.4	.....	Wolver
6	6	12	1.47	54	54	79.4	.....	Wood
6	7	8	1.33	64	43	85.1	.....	Wonder
6	7	12	2.00	54	54	108.0	.....	Wool
7	7	12	2.00	54	54	108.0	.....	Woolen
6	8	8	1.74	64	43	93.6	.....	Wont
6	8	12	2.61	54	54	140.9	.....	Word
7	8	12	2.61	54	54	140.9	.....	Worred
6	9	12	3.31	54	54	178.8	.....	Wore
8	9	12	3.31	54	54	178.8	.....	Work
6	10	12	4.08	54	54	220.3	.....	World
8	10	12	4.08	54	54	220.3	.....	Worldly
8	10	24	8.16	45	90	440.6	.....	Worm
10	12	12	5.88	54	54	317.5	.....	Worship
12	14	12	8.00	54	54	432.0	.....	Worthless
12	14	24	16.00	45	90	720.0	.....	Would
14	16	16	13.9	50	68	696.0	.....	Woven



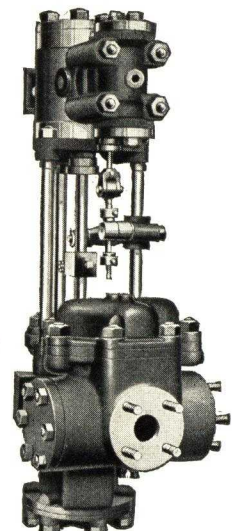
Left:
Fig. 161
Size 16x12x24
Valve Pot Type



Right:
Fig. 179
Size 6½x4½x12
Valve Pot Type



Left:
Fig. 180
Size 6x8x12
Mono-chest
Type



Right:
Fig. 145
Size 3½x4x4
Cap and Plate
Type

WARREN HORIZONTAL DUPLEX PISTON PUMPS

For Boiler Feed or Pressure Service . . . Light Heads or Low Service

Where the duplex type of piston pump is preferred and space permits use of the horizontal type, Warren Horizontal Duplex Piston Pumps are as much the logical choice for your plant as they have been for hundreds of other purchasers whose determination was to insure "lowest possible pumping cost per year." Except for the difference in verti-

cal and horizontal design, these pumps are identical in construction throughout as the vertical pumps described on the succeeding page. The complete range of sizes is given in the tables below.

Note: When writing for information, please give data as outlined on page 9 under the heading, "Essential Information Required."

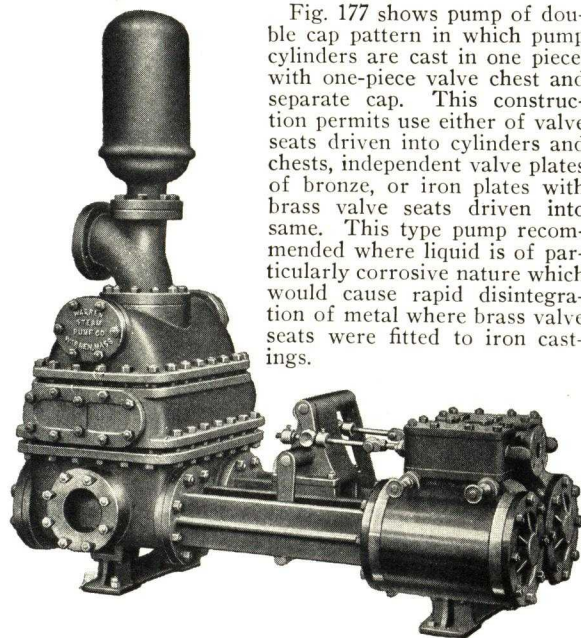


Fig. 177—Size 10x7x12

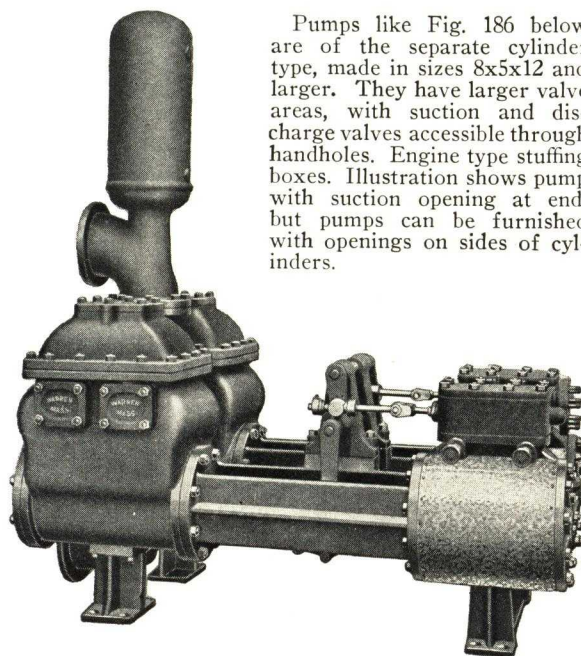


Fig. 186—Size 14x10x12

Fig. 177 shows pump of double cap pattern in which pump cylinders are cast in one piece, with one-piece valve chest and separate cap. This construction permits use either of valve seats driven into cylinders and chests, independent valve plates of bronze, or iron plates with brass valve seats driven into same. This type pump recommended where liquid is of particularly corrosive nature which would cause rapid disintegration of metal where brass valve seats were fitted to iron castings.

Pumps like Fig. 186 below are of the separate cylinder type, made in sizes 8x5x12 and larger. They have larger valve areas, with suction and discharge valves accessible through handholes. Engine type stuffing boxes. Illustration shows pump with suction opening at end, but pumps can be furnished with openings on sides of cylinders.

FOR BOILER FEED OR PRESSURE SERVICE

Size			Capacity				Boiler H. P. based on 34.5 lbs. per H.P. H.	Code word
Diameter		Stroke	Gals. per stroke each piston	Single stroke each side	Ft. piston speed each side	Total g.p.m. both pistons		
Steam cylinder	Pump cylinder							
3	2	3	.04	72	18	5.76	83	Sledge
4½	2¾	4	.10	66	22	13.2	190	Sabot
5¼	3½	5	.208	58	24	24.13	350	Sin
6	4	6	.33	52	26	34.32	497	Silk
7½	5	6	.51	52	26	53.04	768	Shake
7½	5	10	.85	46	38	78.2	1,133	Sharkey
8	5	12	1.02	40	40	81.6	1,182	Persist
10	6	12	1.47	40	40	117.6	1,704	Parable
12	7	12	2.00	40	40	160.0	2,318	Pedigree
12	8½	12	2.95	40	40	236.0	3,420	Peddle
14	8½	12	2.95	40	40	236.0	3,420	Pervert
14	10	12	4.08	40	40	326.4	4,730	Peg
16	10	12	4.08	40	40	326.4	4,730	Pistol
16	10	18	6.12	40	60	489.6	7,095	Pester
16	12	12	5.87	40	40	469.6	6,805	Pink
16	12	18	8.81	40	60	704.8	10,214	Pastry

FOR LIGHT HEADS—LOW SERVICE

3	2 3/4	3	.08	100	25	16.0	.....	Pigmy
4 1/2	3 3/4	4	.19	90	30	34.2	.....	Pony
4 1/2	4	4	.22	90	30	39.6	.....	Pontoon
5 1/4	4 3/4	5	.38	82	34	62.32	.....	Shadow
5 1/4	5	5	.42	82	34	68.88	.....	Shade
6	5 3/4	6	.67	72	36	96.48	.....	Sandal
7 1/2	6	10	1.22	63	52	153.72	.....	Sordid
7 1/2	7	10	1.66	63	52	209.16	.....	Spot
6	7 1/2	6	1.14	72	36	164.16	.....	Sentry
7 1/2	7 1/2	10	1.91	63	52	240.66	.....	Spotter
6	8 1/2	6	1.47	72	36	211.68	.....	Sickle
7 1/2	8 1/2	6	1.47	72	36	211.68	.....	Summer
7 1/2	8 1/2	10	2.45	63	52	308.7	.....	Stag
10	8 1/2	12	2.95	54	54	318.6	.....	Preside
8	10	12	4.08	54	54	440.64	.....	Poverty
10	10	12	4.08	54	54	440.64	.....	Proof
12	10	12	4.08	54	54	440.64	.....	Pulpit
10	12	12	5.87	54	54	633.96	.....	Profile
12	12	12	5.87	54	54	633.96	.....	Puppy
14	12	12	5.87	54	54	633.96	.....	Pungent
12	14	12	8.00	54	54	864.00	.....	Punish
14	14	12	8.00	54	54	864.00	.....	Purge
14	14	18	12.00	54	81	1,296.00	.....	Puritan
14	16	18	15.66	54	81	1,691.3	.....	Purpose
16	16	18	15.66	54	81	1,691.3	.....	Pursue

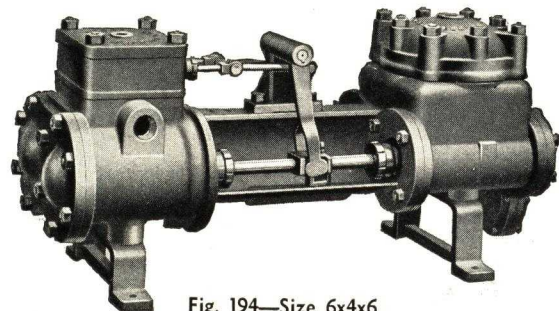


Fig. 194—Size 6x4x6

Pumps in sizes 10x6x12 and smaller are of the type shown in Fig. 194 above, with steam cylinders and center pieces cast in one piece. Stuffing boxes are of the brass screw type.

WARREN VERTICAL DUPLEX PISTON PUMPS

For Boiler Feed or Pressure Service . . . Tank or Light Pressure

These pumps are particularly desirable for service where there is a preference for a duplex piston pump, but where space limitations demand the use of a vertical pump in place of the horizontal type.

As regularly furnished, they are fully brass fitted. Pump end liners, pistons, valve seats, stems, springs, guards and guard nuts are all of brass. Piston rods are solid rolled bronze, except where of the divided type; pump end rods are then made of rolled bronze and the steam end rods of steel, joined by heavy cross heads and caps of cast steel.

Steam pistons are of the solid type with snap rings. Steam cylinders will be lagged with magnesia and covered with planished iron, held by polished brass bands, at extra cost.

Hard or medium rubber pump valves are standard, but at slight extra cost, cast brass disc or phosphor bronze multi-disc type valves may be had. Steam valves on small sizes have adjustments inside of steam chests. On the larger sizes, adjustments are made outside through means of threaded tappet collars.

Can be built to operate on super-heated steam.

FOR BOILER FEED OR PRESSURE SERVICE

Size			Capacity				Boiler H.P. pump will feed	Code word
Steam cylinder	Pump cylinder	Stroke	Gals. per stroke each piston	Strokes per minute each piston	Ft. piston speed each piston	Total gals. per min.		
3	2	3	.04	72	18	5.76	83	Vacant.
4½	2¾	4	.10	66	22	13.2	190	Vacation
5¼	3½	6	.25	52	26	25.9	375	Vacaw
5¾	3¾	8	.332	45	30	29.9	432	Vaccinate
5¾	4	8	.435	45	30	39.1	567	Vagabond
7½	5	8	.68	45	30	61.2	886	Vagalite
8	5	12	1.02	40	40	81.6	1,182	Vagient
9	6	12	1.47	40	40	117.6	1,704	Vagrant
10	6	12	1.47	40	40	117.6	1,704	Vague
10	7	12	2.00	40	40	160.0	2,318	Vail
12	7	12	2.00	40	40	160.0	2,318	Vain
12	8	12	2.61	40	40	208.8	3,026	Vaga
12	8½	12	2.95	40	40	236.0	3,420	Vagary
14	8½	12	2.95	40	40	236.0	3,420	Vakeel

Heavy Pressure—Individual Pot, Piston Steam Valves, Type XL

6	6	6	.73	52	26	76.3	.....	XLFBFA
7½	6	10	1.22	46	38	111.6	.....	XLFBFB
9	8	12	1.47	40	40	117.6	.....	XLFBFC
12	8½	12	2.95	40	40	236.0	.....	XLFBFD
14	11	12	4.93	40	40	394.4	.....	XLFBFE

FOR TANK OR LIGHT SERVICE

3	2¾	3	.08	100	25	16.0	.....	Vamose
4½	4	4	.22	90	30	39.6	.....	Vamp
5¼	5	5	.42	82	34	68.9	.....	Vampire
6	6	6	.73	72	36	115.2	.....	Van
7½	6	12	1.47	54	54	158.8	.....	Vanadium
8	7	12	2.0	54	54	216.0	.....	Vandal
8	8½	12	2.95	54	54	318.4	.....	Vane
10	8½	12	2.95	54	54	318.4	.....	Vanesa
10	10	12	4.08	54	54	440.6	.....	Vanilla
12	10	12	4.08	54	54	440.6	.....	Vanish
10	12	12	5.87	54	54	633.9	.....	Vanity
12	12	12	5.87	54	54	633.9	.....	Vanitone
12	14	12	8.00	54	54	864.0	.....	Vantage

Note: When writing for information, please give data as outlined on page 9 under the heading "Essential Information Needed."

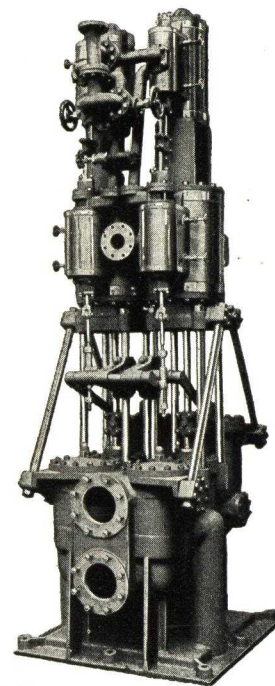


Fig. 309
Size 8x14x10x18
Vertical Compound
Duplex Pump

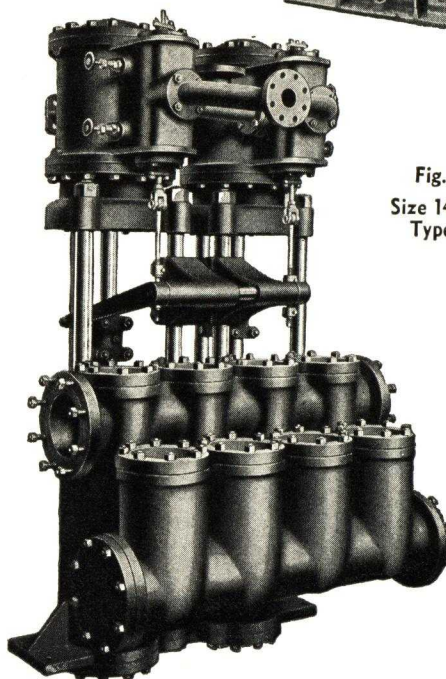


Fig. 313
Size 14x11x12
Type XL

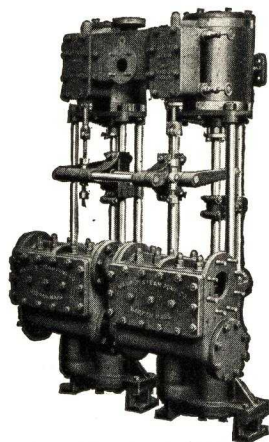


Fig. 184—Size 10x8½x12

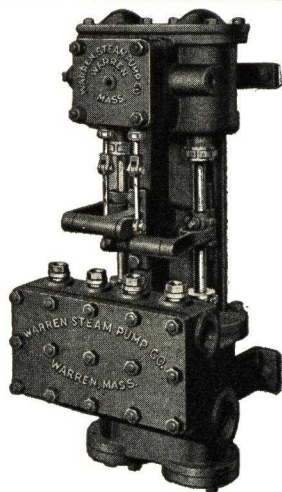


Fig. 52—Size 4½x2¾x4

WARREN DUPLEX AUTOMATIC PUMPS AND RECEIVERS . . . Piston and Plunger Patterns

In design, materials and workmanship . . . in operating efficiency and economy . . . Warren Duplex Automatic Pumps and Receivers fully comply with the Warren standard.

They are used extensively in feeding to boilers the condensation from heating coils, traps, drying kilns, etc., because, designed for the purpose, they bring the condensate into the boiler without the loss of more than a small number of heat units.

As the water rises in the receiver, a float-actuated valve of the balanced-piston type admits steam to the pump, causing it to draw some of the condensate from the receiver. This valve and float mechanism automatically regulates the speed of the pump or stops it when the returns cease to flow into the

receiver. The float, rigidly supported, is on the inside of the receiver and is so arranged that any leakage or accumulation of moisture in same is automatically drawn off to the outside through a hollow shaft to which the regulating lever is attached.

The entire apparatus is mounted on a substantial base, with the receiving unit set high enough upon a pedestal to insure the water level being above the suction valves of the pump at all times.

Warren Duplex Pump and Receiver Units are made in either the piston packed type or the outside end-packed plunger type.

Sizes and particulars of both types are given below.

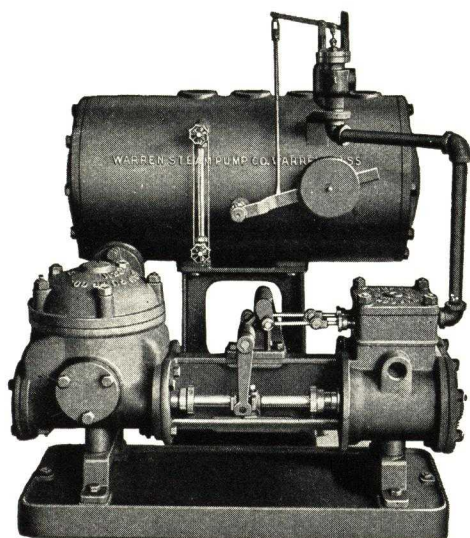


Fig. 176—Size 6x4x6
Duplex Piston Pump and Receiver

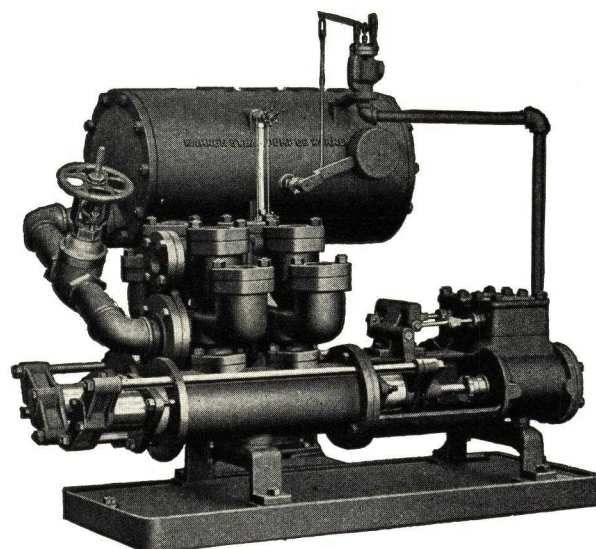


Fig. 188—Size 6x4x6
Duplex Plunger Pump and Receiver

DUPLEX PISTON PUMPS AND RECEIVERS

Size pump	Size receiver	Strokes per side per minute	Gallons per minute	Sq. ft. direct radiation drained	Space occupied, inches			Code word
					Length	Width	Height	
3 x 2 x 3	A	36	2.88	4,320	28	26	32	Roadbed
4½ x 2¾ x 4	B	33	6.6	9,900	33	30	40	Roadway
5¼ x 3½ x 5	C	29	12.06	18,000	42	37	46	Rocky
6 x 4 x 6	D	26	17.16	25,700	45	38	48	Roll
7½ x 5 x 6	E	26	26.5	39,750	60	36¼	55	Rollick
7½ x 5 x 10	F	23	39.1	58,650	66	36¼	55	Rolling

DUPLEX PLUNGER PUMPS AND RECEIVERS

5¼ x 3½ x 5	C	29	12.06	18,000	59	37½	55	Rope
6 x 4 x 6	D	26	17.16	25,700	68½	46½	55	Rose
7½ x 5 x 6	E	26	26.5	39,750	72	46½	55	Rotator
7½ x 5 x 10	F	23	39.1	58,650	92	54	55	Rotrex

WARREN SINGLE OUTSIDE PACKED PLUNGER PUMPS . . . End and Center-Packed

Designed for use in those plants where a single plunger pump best meets requirements, these pumps differ but slightly in general construction from that of the duplex plunger pumps described on the following page. As in the case of the duplex plunger pumps, in the design and manufacture of the single plunger pumps no effort has been spared to produce a product that will give the maximum of efficient service at a minimum pumping cost per year. They are built to the Warren standard, which is complete assurance that the best of materials and expert workmanship enter into their construction.

These pumps, too, as regularly furnished, are equipped with hard, close-grained gray iron plungers, accurately turned and ground to size, with iron glands. Likewise, where desired, they can be had with plungers of bronze, as well as with gland and throat liners of bronze, at additional cost.

Solid type steam pistons with snap rings are standard. Pump valves of bronze and of the bevel-face, wing poppet type with bronze seats are also

standard, but valve seats of the bar type can be furnished with either hard or medium rubber valves or phosphor bronze valves of the multi-disc type.

Available in both the outside end-packed and outside center-packed types. The outside end-packed types have steel piston rods. The outside center-packed types, however, have solid rolled bronze piston rods where of the one-piece type. Where the rods are of the divided type, the outside center-packed pumps have steam rods of steel and pump rods of rolled bronze, joined by heavy cross heads and caps of cast steel.

Every pump of this class is fitted with the patented Warren "Eclipse" Valve Gear for economy in steam consumption and minimum wear on the valves. This valve gear is described on page 10 under Warren Vertical Single Piston Pumps.

Where desired, steam cylinders will be lagged with magnesia and covered with planished iron held by polished brass bands, at extra cost.

Can be built to operate on super-heated steam.

FOR BOILER FEED OR PRESSURE SERVICE

Outside End-Packed

Size			Capacity					Code word
Steam cylinder	Pump cylinder	Stroke	Gals. per stroke	Strokes per min.	Ft. piston speed	Total gals. per min.	Boiler H.P. pump will feed	
8	5	12	1.02	40	40	40.81	591	Koa
10	6	12	1.47	40	40	58.8	852	Kobold
12	7	12	2.00	40	40	80.0	1,160	Kodak
14	7	12	2.00	40	40	80.0	1,160	Koff
14	7	16	2.66	38	50	101.0	1,465	Kola
14	8	12	2.61	40	40	104.4	1,513	Koodoo
14	8	16	3.49	38	50	132.6	1,920	Kopi
14	8½	12	2.95	40	40	118.0	1,710	Koran
14	8½	16	3.93	38	50	149.4	2,165	Koto

Outside Center-Packed

8	5	12	1.02	40	40	40.8	591	Kraal
10	6	12	1.47	40	40	58.8	852	Kraken
12	7	12	2.00	40	40	80.0	1,160	Kremlin
12	8	12	2.61	40	40	104.4	1,513	Kris
14	8½	12	2.95	40	40	118.0	1,710	Krone
14	9	18	4.95	40	60	198.0	2,870	Krypton
14	10	18	6.12	40	60	244.8	3,540	Kuklux
16	10	18	6.12	40	60	244.8	3,540	Kultur
18	10	18	6.12	40	60	244.8	3,540	Kumiss
18	15	18	13.77	40	60	551.0	.....	Kutch
18	15	24	18.36	32	64	588.0	.....	Kyanize

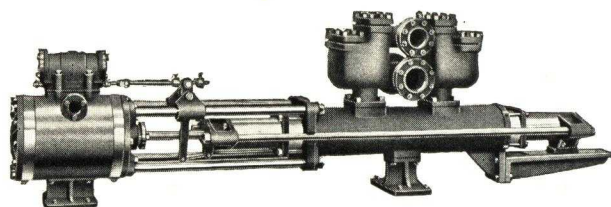


Fig. 192—Size 14x7x16—Outside End-Packed

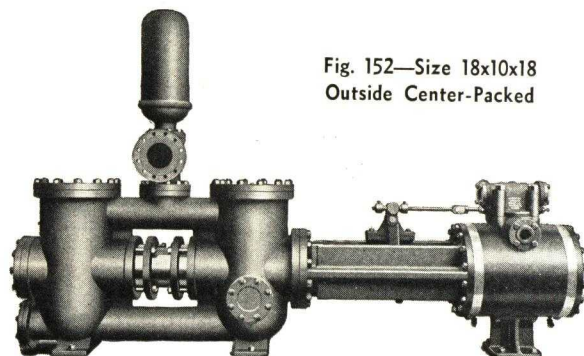


Fig. 152—Size 18x10x18
Outside Center-Packed

Essential Information Needed

The Warren Engineering Department is always glad to co-operate with you to the fullest extent in order to assure you of the utmost efficiency and economy from every pumping installation. When writing for information on the above pumps, or any other of the Warren Reciprocating Pumps shown in this catalogue, we will be able to serve you to the best advantage if you will provide us with detailed data of the type listed on page 9 under Horizontal Single Piston Pumps.

WARREN DUPLEX OUTSIDE PACKED PLUNGER PUMPS . . . End and Center-Packed

Long after the original investment in a pump is forgotten, there is one item that always remains either to plague or to please the purchaser: *pumping cost per year!* In this all-important point, this measure of a pump's true value to the plant, is reflected the care and consideration given to the selection of that pump in the very beginning.

A Warren Duplex Plunger Pump chosen now is a guarantee of pumping satisfaction for the years to come, for, by Warren policy, that is the purpose behind its design and construction.

As regularly furnished, these pumps are fitted with plungers of hard, close-grained gray iron, accurately turned and ground to size, and with iron glands. Pumps, however, can be furnished with gland and throat liners of bronze, as well as plungers of bronze, at additional cost. Steam pistons are of the solid type with snap rings. Steam valves are of the flat-face slide type and on the

smaller pumps have adjustments inside of steam chests. On the larger sizes, adjustments are made outside through means of threaded tappet collars. Pump valves are bronze, of the bevel-face, wing poppet type with bronze seats. If desired, valve seats of the bar type can be furnished with either hard or medium rubber valves, or phosphor bronze valves of the multi-disc type. Steam cylinders will be lagged with magnesia and covered with planished iron held by polished brass bands, at extra cost.

Warren Duplex Plunger Pumps are made in both the outside end-packed and the outside center-packed types. Outside end-packed pumps have piston rods of steel. Outside center-packed pumps have piston rods of solid rolled bronze where of the one-piece type. Where rods are of the divided type, the steam rods are of steel and the pump rods of rolled bronze, joined by heavy cross heads and caps of cast steel.

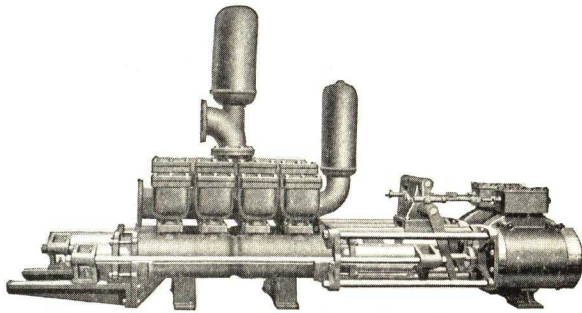


Fig. 100—Size 14x8x18—Pot Valve Type, End-Packed

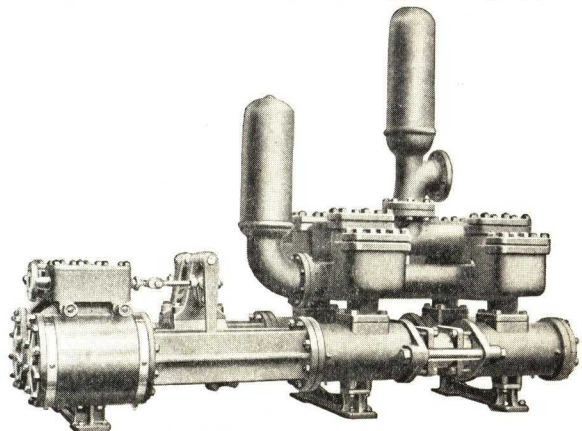


Fig. 123—Size 12x7x12—Pot Valve Type, Center-Packed

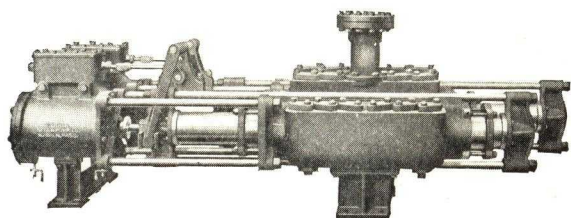


Fig. 75—Size 14x8 1/2 x 12—Solid Barrel Type, End-Packed

FOR BOILER FEED OR PRESSURE SERVICE

Outside End-Packed—Pot Valve Pattern

Size			Capacity					Code word
Steam cylinder	Pump cylinder	Stroke	Gals. per stroke each plunger	Single stroke each plunger	Ft. piston speed each plunger	Total g.p.m. both plungers	Boiler H.P. pump will feed	
5 1/4	3 1/2	5	.208	58	24	24.12	350	Pomadman
6	4	6	.33	52	26	34.32	497	Pomadrepore
7 1/2	5	6	.51	52	26	53.04	768	Pomagnate
7 1/2	5	10	.85	46	38	78.2	1,133	Pomagician
8	5	12	1.02	40	40	81.6	1,182	Pomachete
10	5	12	1.02	40	40	81.6	1,182	Pomacho
10	6	12	1.47	40	40	117.6	1,704	Pomacle
12	6	12	1.47	40	40	117.6	1,704	Pomacro
12	7	12	2.00	40	40	160.0	2,318	Pomactra
14	8	12	2.61	40	40	208.8	3,026	Pomadam
14	8 1/2	12	2.95	40	40	236.0	3,420	Pomade
14	8	18	3.91	40	60	312.8	4,530	Pomean
14	8 1/2	18	4.43	40	60	354.4	5,136	Pomeasure
14	9	18	4.95	40	60	396.0	5,740	Pomedal
14	10	18	6.12	40	60	489.6	7,095	Pomeek

Outside End-Packed—Solid Barrel Pattern

7 1/2	4 1/2	10	.69	46	38	63.5	920	Magic
8	5	12	1.02	40	40	81.6	1,182	Machete
10	6	12	1.47	40	40	117.6	1,704	Macle
12	7	12	2.00	40	40	160.0	2,318	Mactra
14	8	12	2.61	40	40	208.8	3,026	Madam
14	8 1/2	12	2.95	40	40	236.0	3,420	Made
14	8	18	3.91	40	60	312.8	4,530	Mean
14	9	18	4.95	40	60	396.0	5,740	Meek

Outside Center-Packed

7 1/2	4 1/2	10	.69	46	38	63.5	920	Fabian
8	5	10	.85	46	38	78.2	1,133	Fabric
8	5	12	1.02	40	40	81.6	1,182	Facade
10	6	12	1.47	40	40	117.6	1,704	Facet
12	7	12	2.00	40	40	160.0	2,318	Facile
12	8	12	2.61	40	40	208.8	3,026	Faction
14	8	12	2.61	40	40	208.8	3,026	Factor
14	9	18	4.95	40	60	396.0	5,740	Fade
14	10	18	6.12	40	60	489.6	7,095	Fag
16	10	18	6.12	40	60	489.6	7,095	Fallow
18	12	18	8.81	40	60	704.8	10,214	Fame
18	15	18	13.77	40	60	1,102.0	.....	Fancy
24	15	24	18.36	32	64	1,175.0	.....	Fing

Essential Information Needed

When writing for information, please give data as outlined on page 9, under the heading "Essential Information Needed."



RODNEY HUNT

WATER CONTROLLING APPARATUS

• • •
SLUICE GATES
FLOOR STANDS
GATE HOISTS
HAND, ELECTRIC, HYDRAULIC
SHEAR GATES
FLAP VALVES
MUD VALVES
BUTTERFLY VALVES
• • •



THE COMPANY AND ITS SERVICES

The "RODNEY HUNT" MACHINE COMPANY, with an experience of over half a century in the manufacture and installation of water power and water control apparatus, is eminently fitted to furnish practical apparatus of superior quality. Besides possessing the advantage of experience, a forward-looking management aims to keep abreast of all the new developments and to cater to the new problems of the trade.

The concern is located in Orange, Massachusetts, on the Mohawk Trail, eighty miles west of Boston. The railroad facilities are of the best, the company having its own sidings served by the Fitchburg Division of the Boston and Maine Railroad, and is thus on the trunk line to the West. The physical equipment of the company, both of buildings and of machinery, is up-to-date and able to cope with any manufacturing problem within its compass. Power is supplied by its own hydro-electric plant.

• PRODUCTS •

The apparatus as manufactured by the "Rodney Hunt" Company comprise an extensive line of Floor Stands, Gate Valves, Sluice Gates, Turbine and Water Wheels, Mud Valves, Shear Gates, Flap Valves and Accessories. These are described and illustrated pictorially and diagrammatically along with complete tabulations of sizes and capacities, for aiding engineers, designers and customers in the construction of layouts and selection of equipment for their needs.

• ENGINEERING SERVICE •

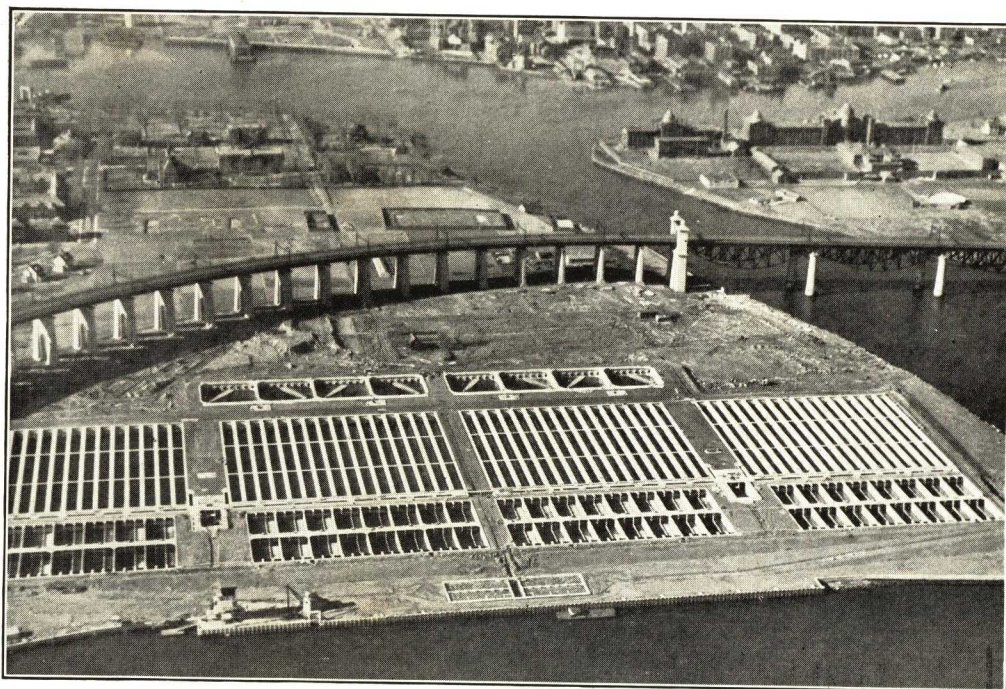
Our competent staff of engineers is at the service of our customers and is in a position to make valuable suggestions regarding the installation of our equipment for both usual and unusual conditions. While this Catalogue is designed to be reasonably complete, it can never answer all questions that may arise and here the engineering department stands ready to furnish additional information.

• GUARANTY •

The "RODNEY HUNT" MACHINE COMPANY is in a position to guarantee all "Rodney Hunt" apparatus to perform the duty for which it is recommended. Any parts which may develop inherent defects under normal and proper use within one year after shipment will be replaced F.O.B. our factory at our expense, provided that purchaser gives immediate notice and such breakage shows unmistakable evidence of faulty material or workmanship. However, we shall not be held responsible for any loss, damage or delays resulting from strikes, lock-outs or other causes beyond our control, or on account of defects as above specified.

• PRICES •

Prices of apparatus will be sent upon request. In addition, we solicit the opportunity of quoting prices for any special Water Control Apparatus not shown in this Catalogue that may be desired.



Ward's Island Sewage Treatment Works, Department of Filtration, City of New York

342 Rodney Hunt Sluice Gates used in this plant

N. Y. Airview Service,
Flushing Airport, N. Y.

RODNEY HUNT MACHINE CO.

ORANGE, MASS., U. S. A.

Copyright 1933, Rodney Hunt Machine Co.

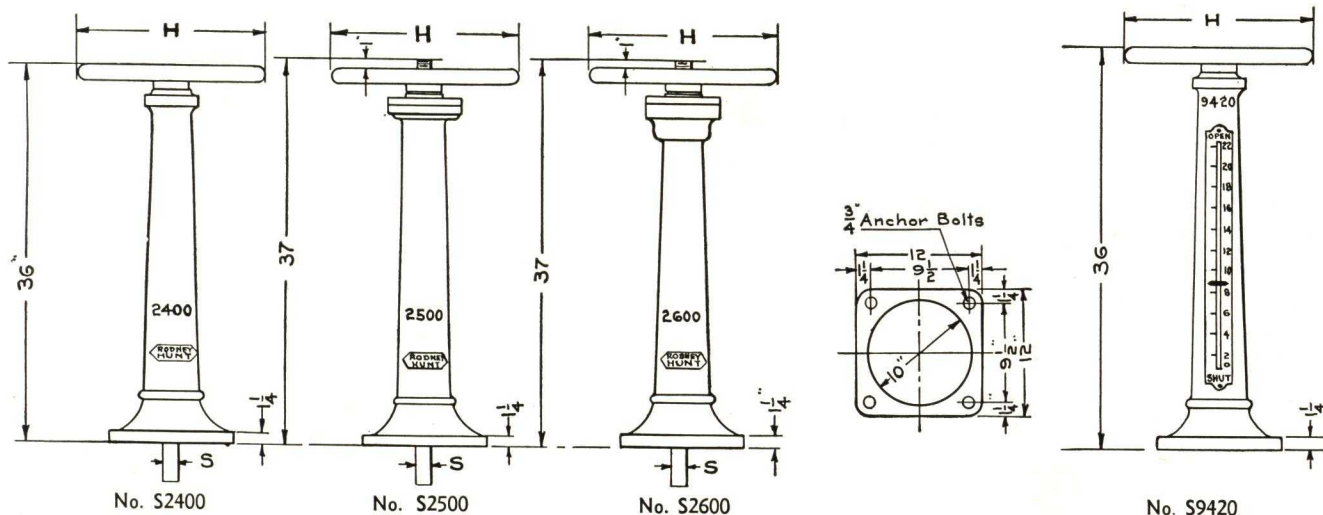
"TRI-SEAL" HANDWHEEL FLOOR STANDS

The stand type of hoist for operating gates and valves has many distinct advantages, and is replacing the old type or rack and pinion hoist, on account of its compactness and better appearance. They are extremely compact; easy operating, self-locking at any position of gate opening; pleasing in appearance, and can be varied in design to operate either rising or non-rising stems.

The "Rodney Hunt" Stand is extremely rugged, with a single, well proportioned pedestal casting. The bronze lifting nut is carefully machined, and the thrust bearings are of ball type. The sturdy, heavy base insures an accurate, rigid guide and support for both stem and hand wheel.

Drs. S2400, S2500, S2600 and S9400 Series of Medium Duty Floor Stands, are for use wherever the gate in its open position is below the level of the pedestal base.

No. S2400 is for operation of gates having non-rising stems, while No. S2500 and No. S2600 are for use in connection with rising stems. No. S2400 consists of a cast iron pedestal, which serves as a support for the stem, and handwheel which is keyed to the stem. The S2500 has bronze operating nut with plain bearings, and the S2600 has ball bearings both above and below the operating nut collar.



NO. S2500 "TRI-SEAL" HANDWHEEL FLOOR STANDS WITH RISING STEMS AND PLAIN BEARINGS

Stand Number	Diameter of Handwheel "H", in.	Approximate weight of stand in lbs.	No. of turns of hand-wheel per ft. travel of stem	Pounds pull on hand-wheel rim to develop full safe stem load	*Safe stem load in compression (lbs.)	Diameter of stem "S", in.	No. of Acme threads per inch	Weight of plain steel stem in lbs. per ft.	Torque in inch lbs. exerted by a single 25-lb. force on rim of handwheel	Recommended Spacing of Stem Guides	
										Plain stems	Threaded stems
S2521	21	150	42	170	4800	1 1/2	3 1/2	6.01	.....	7'-6"	5'-0"
S2524	24	155	42	150	4800	1 1/2	3 1/2	6.01	.....	7'-6"	5'-0"
S2530	30	195	36	180	6300	1 3/4	3 1/2	8.18	.....	8'-6"	6'-0"
S2536	36	260	36	220	9000	2	3	10.68	.....	10'-0"	7'-0"

Add 4% to the above stem weights if stems are of bronze.

†Lifting capacities proportional to pull on handwheel rim up to safe stem load.

*Safe stem loads in tension are approximately 2 1/2 times these compressive values.

For help in selection of sizes, see pages 8 to 12, or consult our Engineering Department.

NO. S2400 "TRI-SEAL" HANDWHEEL FLOOR STANDS WITH NON-RISING STEMS

Stand Number	Diameter of Handwheel "H", in.	Approximate weight of stand in lbs.	No. of turns of hand-wheel per ft. travel of stem	Pounds pull on hand-wheel rim to develop full safe stem load	*Safe stem load in compression (lbs.)	Diameter of stem "S", in.	No. of Acme threads per inch	Weight of plain steel stem in lbs. per ft.	Torque in inch lbs. exerted by a single 25-lb. force on rim of handwheel	Recommended Spacing of Stem Guides
S2421	21	145	42	170	4800	1 1/2	3 1/2	6.01	262	9'-0"
S2424	24	150	42	150	4800	1 1/2	3 1/2	6.01	300	9'-0"
S2430	30	190	36	180	6300	1 3/4	3 1/2	8.18	375	10'-6"
S2436	36	255	36	220	9000	2	3	10.68	450	12'-0"

NO. S2600 "TRI-SEAL" HANDWHEEL FLOOR STANDS WITH RISING STEMS AND BALL BEARINGS

Stand Number	Diameter of Handwheel "H", in.	Approximate weight of stand in lbs.	No. of turns of hand-wheel per ft. travel of stem	Pounds pull on hand-wheel rim to develop full safe stem load	*Safe stem load in compression (lbs.)	Diameter of stem "S", in.	No. of Acme threads per inch	Weight of plain steel stem in lbs. per ft.	Torque in inch lbs. exerted by a single 25-lb. force on rim of handwheel	Recommended Spacing of Stem Guides
S2621	21	160	42	60	4800	1 1/2	3 1/2	6.01	.....	7'-6"
S2624	24	165	42	52	4800	1 1/2	3 1/2	6.01	.....	7'-6"
S2630	30	205	36	63	6300	1 3/4	3	8.18	.....	8'-6"
S2636	36	270	36	82	9000	2	3	10.68	.....	10'-0"

See Catalogue No. 30, Sec. W. C. A. for Open Type Gear and Other Hoists

"TRI-SEAL" ENCLOSED GEARED FLOOR STANDS

For Screw Stem Gates

These types are favored for heavy duty lifting, because of their compactness and the fact that the screw thread of the gate stem allows the gate to be stopped and held at any stage of opening. These stands can be adapted to either rising or non-rising stems. Selective two-speed gear ratios and the fact that the handle is removable or may be locked to prevent tampering, are other important advantages.

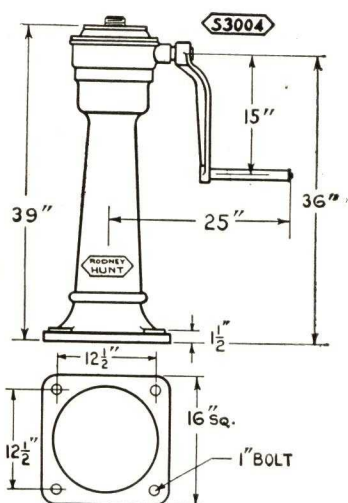
No. S3004 is a Single Geared Floor Stand with a 4:1 gear ratio—four crank revolutions giving the lifting nut one revolution. The bevel pinion and gear are of heat treated steel with cut teeth. The end thrust of the stem is taken by ball bearings. Made also in double crank arrangement for two-man operation and is designated as No. S3204. No. S3104 represents the same stand, except that it is equipped with a 24-inch hand wheel instead of the hand crank.

No. S3012 is a back geared type of floor stand with a 12:1 gear ratio, affording a very powerful hoist for operating heavy gates and valves. It is also made in a double crank arrange-

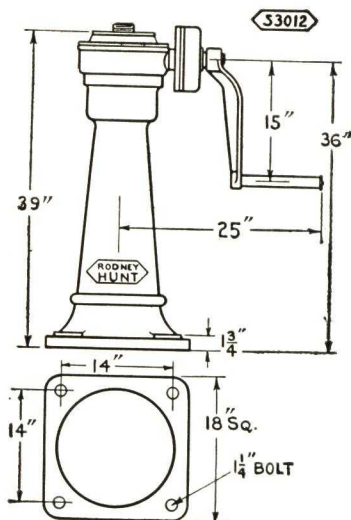
ment and is designated as No. S3212. The lifting nut is of bronze driven by a bevel gear and pinion of forged steel with cut teeth, these gears being of 4 to 1 ratio. The back gearing, used to give low speed and maximum power, consists of cast iron gears with cut teeth of 3 to 1 ratio; this gives a combined gear ratio of 12 to 1.

The low or back geared position for attaching crank is invaluable for starting as well as for seating some types of gates.

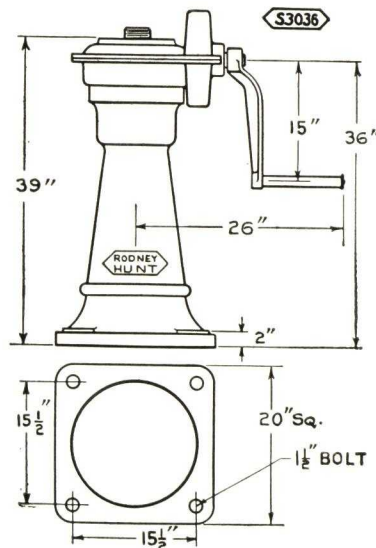
No. S3036 is one of the most powerful floor stands made by Rodney Hunt. Despite its immense capacity, it is very compact. The gear arrangement consists of a spur pinion meshing with a spur gear which is on the same spindle as a quadruple thread worm which in turn acts on the worm gear that carries the bronze lifting nut. The gear ratio here is 36 to 1. Not only is the end thrust of the stem taken by thrust ball bearings but the entire worm shaft is mounted in roller and thrust ball bearings. Also has the same durable stud advantages as No. S3012 which is extremely useful for heavier load conditions.



No. S3004



No. S3012



No. S3036

NO. S3004 "TRI-SEAL" ENCLOSED GEARED FLOOR STANDS

Stand Number	Diameter of stem "S", in.	No. of Acme Threads per inch.	Weight of plain steel stem in lbs. per ft.	Recommended Spacing of Stem Guides		Approximate weight of stand, lbs.	Pounds pull on handwheel rim to develop full safe stem load	*Safe stem load in compression (lbs.)
				Plain stems	Threaded stems			
S3004-f	2	3	10.68	9'-3"	6'-3"	345	60	11,000
S3004-g	2 1/4	3	13.52	10'-3"	7'-3"		88	15,000
S3004-h	2 1/2	3	16.69	11'-0"	8'-0"		125	19,500

NO. S3012 "TRI-SEAL" ENCLOSED GEARED FLOOR STANDS

S3012-g	2 1/4	3	13.52	10'-3"	7'-3"	455	25	15,000
S3012-h	2 1/2	3	16.69	11'-0"	8'-0"		35	19,500
S3012-j	2 3/4	2 1/2	20.19	12'-0"	8'-9"		47	23,000
S3012-k	3	2 1/2	24.03	13'-0"	9'-6"		64	29,000

NO. S3036 "TRI-SEAL" ENCLOSED GEARED FLOOR STANDS

S3036-h	2 1/2	3	16.69	11'-0"	8'-0"	850	14	19,500
S3036-j	2 3/4	2 1/2	20.19	12'-0"	8'-9"		18	23,000
S3036-k	3	2 1/2	24.03	13'-0"	9'-3"		25	30,000
S3036-m	3 1/4	2 1/2	28.21	14'-0"	10'-6"		31	35,000
S3036-n	3 1/2	2	32.71	15'-0"	11'-0"		33	38,500

Add 4% to the above stem weights if the stems are of bronze.

†Lifting capacities proportional to pull on handwheel rim up to safe stem load.

*Safe stem loads in tension are approximately 2 1/2 times these compressive values.

Dimensions given in inches

See Catalogue No. 30, Sec. W. C. A. for Open Type Gear and Other Hoists

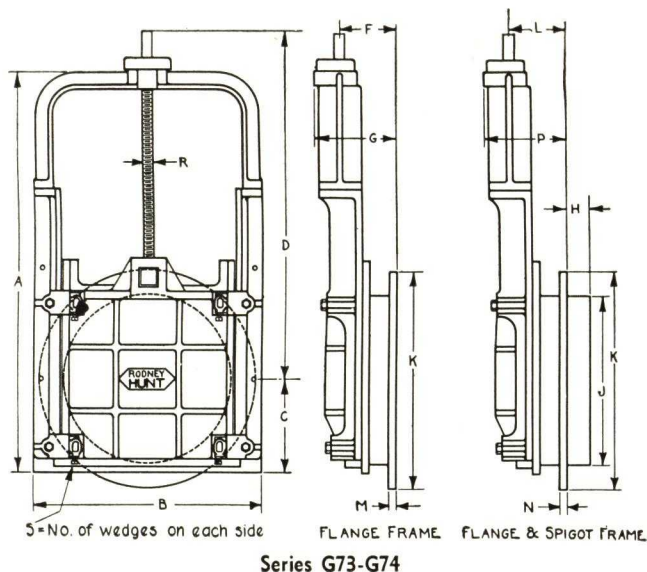
"TESTITE" SELF-CONTAINED SLUICE GATES

"Rodney Hunt" Self Contained or Non-Rising Stem Gates are usually selected for low heads. They may be operated by a plain nut wrench, by a handwheel or by a floor stand; the floor stand may be operated by hand, by motor drive or by a hydraulic cylinder.

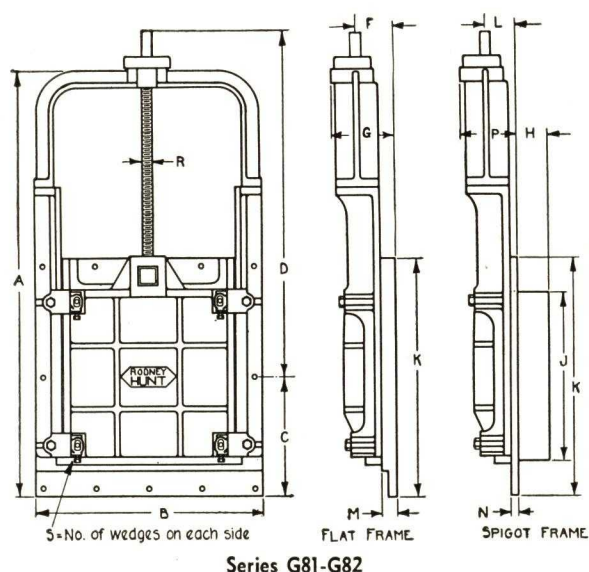
The diagrams herewith indicate the styles of frames most commonly used, although other types are fur-

nished when required. The bronze facings in "Rodney Hunt" Gates are most substantial, being much heavier than those ordinarily used. Ample clearance height is provided and the machine finishing is most exact.

Screw stems are of bronze and are most carefully finished to gauges, insuring smooth and even operation.



Series G73-G74



Series G81-G82

NOS. G73-G74 "TESTITE" ADJUSTABLE WEDGES, RECTANGULAR SLIDE, NON-RISING STEM

Flange frame		Flange and spigot frame		Gate size	A	B	C	D	F	G	H	J	K	L	M	N	P	R	S
No.	Code	No.	Code																
G7306	Grab	G7406	Graph	6	20 1/2	13 1/2	4 3/8	22	6 1/8	7 1/2	4	7	11	6 1/8	3/4	3/4	7 1/2	1 1/8	1
G7308	Grace	G7408	Grapple	8	24 3/8	15 1/2	5 3/8	25 1/8	6 3/8	7 1/2	4	9	13 1/2	6 3/8	1 1/16	1 1/16	7 1/2	1 1/4	1
G7310	Grade	G7410	Grasp	10	28 3/8	17 1/2	6 3/8	28 1/8	6 3/4	7 3/8	4	11	16	6 3/4	7/8	7/8	7 3/8	1 3/4	1
G7312	Graft	G7412	Grass	12	32 3/8	19 1/2	7 3/8	31 3/8	6 3/4	7 3/8	4	13 1/8	19	6 3/4	1 1/16	1 1/16	7 3/8	1 3/8	2
G7314	Grain	G7414	Grate	14	36 3/8	21 1/2	8 3/8	34 3/8	6 3/4	9 3/8	4	15 1/8	21	6 3/4	1	1	9 3/8	1 3/8	2
G7315	Gram	G7415	Grateful	15	39 3/8	22 1/2	9	36 3/8	6 3/4	9 3/8	4	16 1/8	22 1/4	6 3/4	1	1	9 3/8	1 1/2	2
G7316	Grammar	G7416	Gratis	16	41 1/8	23 1/2	9 1/2	38	6 3/4	9 3/8	4	17 1/4	23 1/2	6 3/4	1 1/16	1 1/16	9 3/8	1 1/2	2
G7318	Grand	G7418	Grave	18	46 1/2	27	10 3/4	42 1/8	7 3/8	10 1/2	4	19 1/4	25	7 3/8	1 1/8	1 1/8	10 1/2	1 1/2	2
G7320	Granite	G7420	Gravy	20	50 3/4	29	11 3/4	45 3/4	7 3/8	10 1/2	4	21 3/8	27 1/2	7 3/8	1 1/16	1 1/16	10 1/2	1 3/8	2
G7324	Grant	G7424	Gray	24	58 3/4	33	13 3/4	51 3/4	9 1/8	12 1/2	4	25 1/2	32	9 1/8	1 1/4	1 1/4	12 1/2	1 3/4	2
G7330	Grape	G7430	Graze	30	71	39	16 3/4	53	9 3/8	12 3/4	4	31 3/4	38 3/4	9 3/8	1 3/8	1 3/8	12 3/4	2	3

NOS. G81-G82 "TESTITE" RECTANGULAR SLUICE GATE, ADJUSTABLE WEDGES, NON-RISING STEM

Flat frame		Spigot frame		Gate size	A	B	C	D	F	G	H	J	K	L	M	N	P	R	S
No.	Code	No.	Code																
G810606	Glacial	G820606	Glimpse	6x6	23 1/8	13 1/2	7	22	3 3/4	5 1/8	4	7	14	3	1 5/8	7/8	4 3/8	1 1/8	1
G810808	Glad	G820808	Glitter	8x8	27 1/4	15 1/2	8	25 1/8	3 3/4	5 1/8	4	9	16	3	1 5/8	7/8	4 3/8	1 1/4	1
G811010	Gladdden	G821010	Gloat	10x10	31 1/4	17 1/2	9	28 1/8	3 3/4	5 1/8	4	11	18	3	1 5/8	7/8	4 3/8	1 1/4	1
G811212	Glace	G821212	Globe	12x12	35 1/2	19 1/2	10	31 3/8	3 3/4	5 1/8	4	13 1/8	20	3	1 5/8	7/8	4 3/8	1 3/8	2
G811414	Gland	G821414	Gloom	14x14	39 1/2	21 1/2	11	34 3/8	3 3/4	7	4	15 1/8	22	3 1/8	1 5/8	7/8	6 1/4	1 3/8	2
G811515	Glare	G821515	Glory	15x15	41 3/8	22 1/2	11 1/2	36 3/8	3 3/8	7	4	16 1/8	23	3 1/8	1 5/8	7/8	6 1/4	1 1/2	2
G811616	Glass	G821616	Gloss	16x16	43 3/8	23 1/2	12	38	3 3/8	7	4	17 1/4	24	3 1/8	1 5/8	7/8	6 1/4	1 1/2	2
G811818	Glazier	G821818	Glow	18x18	49 3/4	27	14	42 1/4	4 3/4	7 7/8	4	19 1/4	28	3 3/4	2	1	6 7/8	1 1/2	2
G812020	Gleam	G822020	Glue	20x20	54	29	15	45 3/4	4 3/4	7 7/8	4	21 3/8	30	3 3/4	2	1	6 7/8	1 3/8	2
G812424	Glen	G822424	Glum	24x24	62	33	17	51 3/4	5	8 1/8	4	25 1/2	34	4	2	1	7 1/8	1 3/4	2
G813030	Glide	G823030	Glutton	30x30	74 1/4	39	20	53	5	8 3/8	4	31 3/4	40	4	2	1	7 3/8	2	3

Dimensions are given in inches

"TESTITE" CIRCULAR OPENING SLUICE GATES

Rising Stem

"Rodney Hunt" Circular Opening Sluice Gates are furnished for low, medium and high heads. Plain gates are used in those situations where water pressure acts on one side of the gate only, while the wedge type is necessary for those conditions where back pressure exists, or where water pressure acts on both sides of the gate.

Small low pressure gates are usually supplied with plain circular slides. Medium and heavy pressure gates have square slides, thereby providing long pressure bearing surfaces which prevent the slides from bending when partly open and causing extra wear and damage to the bronze seat.

Rectangular Slide

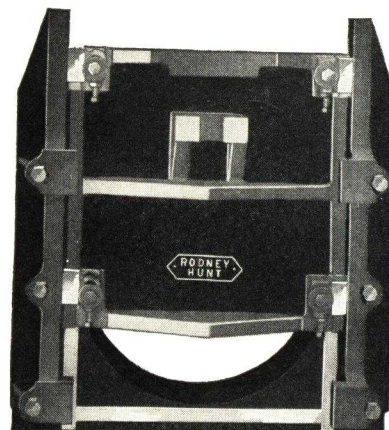
Circular Slide

Rising spindles are most commonly made of steel, however, bronze stems are frequently supplied. For exposed conditions, bronze stem extensions should replace steel.

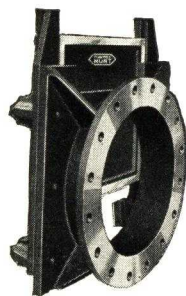
These gates are equally well operated by hand, power, hydraulic or pneumatic cylinders. Substantial gate stem anchorage is assured in all "Rodney Hunt" Sluice Gates, unusual attention being paid to this important detail. The dependable service rendered by these gates emphasize the real value of "That Extra Factor of Safety."



Nos. G13-14A
"Testite"
Plain Rising Stem
Circular Gate with
Circular Slide



Nos. G13-14B "Testite"
Circular Gate with Square Slide, Heavy
Bronze Facings, Adjustable Wedges



Nos. G13-14C
"Testite" Circular Sluice Gate

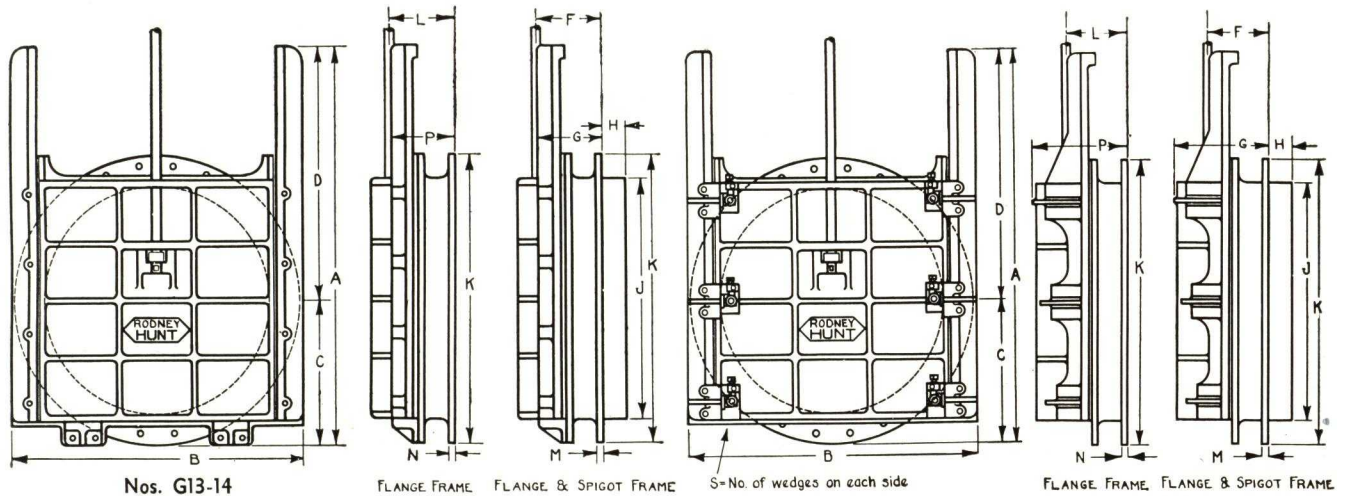


No. GS13
Type of Gate for
Face Pressure



No. GS33
Type of Gate for
Reverse Pressure

DIAGRAMS AND DIMENSIONS, "TESTITE" CIRCULAR OPENING SLUICE GATES



Nos. G13-14

FLANGE FRAME FLANGE & SPIGOT FRAME S-No. of wedges on each side

FLANGE FRAME FLANGE & SPIGOT FRAME

NOS. G13-14 "TESTITE" WEDGELESS TYPE, RECTANGULAR SLIDE, RISING STEM

Flange frame		Flange and spigot frame		Gate size	A	B	C	D	F	G	H	J	K	L	M	N	P
No.	Code	No.	Code														
G1306	Gab	G1406	Gang	6	11 1/4	14	4 1/4	7	6 5/8	6 1/2	4	7	11	6 3/8	3 1/4	3 1/4	6 1/4
G1308	Gable	G1408	Gangster	8	14 1/4	16	5 1/4	9	6 5/8	6 1/2	4	9	13 1/2	6 3/8	1 5/8	1 5/8	6 5/8
G1310	Gad	G1410	Gap	10	17 3/4	18	6 1/4	11 1/2	6 5/8	6 1/2	4	11	16	6 5/8	7/8	7/8	6 9/8
G1312	Gag	G1412	Gape	12	20 3/4	20	7 1/4	13 1/2	6 5/8	6 3/4	4	13 1/2	19	6 5/8	1 5/8	1 5/8	6 9/8
G1314	Gaity	G1414	Garb	14	23 3/4	22	8 1/4	15 1/2	7 1/8	7	4	15 1/2	21	6 5/8	1	1	6 13/16
G1315	Gain	G1415	Garden	15	25 1/4	23	8 3/4	16 1/2	7 1/8	7	4	16 1/2	22 1/4	6 5/8	1	1	6 13/16
G1316	Gainly	G1416	Garlic	16	27 1/4	24	9 1/4	17 3/4	7 1/8	7	4	17 1/4	23 1/2	6 5/8	1 1/8	1 1/8	6 13/16
G1318	Gainful	G1418	Garnet	18	33 1/4	28	13 1/2	19 3/4	9 1/8	9	4	19 1/4	25	8 7/8	1 1/8	1 1/8	6 13/16
G1320	Gala	G1420	Garnish	20	36 1/4	30	14 1/2	22	9 3/8	9 1/4	4	21 3/4	27 1/2	9 1/8	1 3/8	1 3/8	8 3/4
G1324	Gale	G1424	Garret	24	42 1/2	34	16 1/2	26	9 5/8	9 1/4	4	25 1/2	32	9 3/8	1 1/2	1 1/2	9
G1330	Gall	G1430	Garter	30	52	40	19 1/2	32 1/2	10	9 1/2	4	31 3/4	38 3/4	9 3/4	1 3/4	1 3/4	9 1/4
G1336	Gallant	G1436	Gas	36	62 1/2	50	24	38 1/2	11 1/2	11 1/2	5	38	46	11 1/2	1 1/2	1 1/2	11
G1342	Galley	G1442	Gasket	42	71 3/4	56	27	44 3/4	11 1/2	11 1/2	5	44 1/2	53	11 5/8	1 5/8	1 5/8	11 1/4
G1348	Gallop	G1448	Gasp	48	81	62	30	51	12 1/8	11 1/2	5	50 1/2	59 1/2	11 7/8	1 5/8	1 5/8	11 1/4
G1354	Gallows	G1454	Gat	54	90 1/4	68	33	57 1/4	12 1/8	11 5/8	5	56 1/2	66 1/4	12 1/4	1 3/4	1 3/4	11 1/2
G1360	Galore	G1460	Gather	60	99 1/4	74	36	63 1/2	12 1/2	11 3/4	5	62 3/4	73	12 1/4	1 3/4	1 3/4	11 1/2
G1366	Gamble	G1466	Gaudy	66	108 3/4	80	39	69 3/4	13	12 1/4	5	68 3/4	80	12 3/4	1 3/4	1 3/4	11 3/4
G1372	Gambler	G1472	Gauge	72	118	86	42	76	13 1/8	12 1/4	5	74 3/4	86 1/2	12 7/8	1 7/8	1 7/8	11 3/4
G1378	Game	G1478	Gauze	78	128	92	45	83	13 3/8	12 1/4	5	80 3/4	93	13 3/8	2	2	12
G1384	Gamut	G1484	Gay	84	137	100	48	89	14 3/8	13	6	86 3/4	99 3/4	14 1/2	2	2	12 3/4
G1396	Gander	G1496	Gaze	96	155	112	54	101	15 1/4	13 1/2	6	98 3/4	113 1/4	15	2 1/4	2 1/4	13 1/4

Nos. G33-34

NOS. G33-34 "TESTITE" ADJUSTABLE SIDE WEDGES, RECTANGULAR SLIDE, RISING STEM

Flange frame		Flange and spigot frame		Gate size	A	B	C	D	F	G	H	J	K	L	M	N	P	S
No.	Code	No.	Code															
G3306	Giant	G3406	Gimcrack	6	11 1/4	14	4 1/4	7	6 7/8	9 3/8	4	7	11	6 3/8	3/4	3/4	9 1/8	1
G3308	Gib	G3408	Gimlet	8	14 1/4	16	5 1/4	9	6 5/8	9 3/8	4	9	13 1/2	6 3/8	1 5/8	1 5/8	9 1/8	1
G3310	Gibber	G3410	Gimp	10	17 3/4	18	6 1/4	11 1/2	6 5/8	9 1/2	4	11	16	6 5/8	7/8	7/8	9 1/4	1
G3312	Gibbet	G3412	Gin	12	20 3/4	20	7 1/4	13 1/2	6 5/8	10 3/4	4	13 1/2	19	6 5/8	1 5/8	1 5/8	10 1/2	2
G3314	Gibbous	G3414	Ginger	14	23 3/4	22	8 1/4	15 1/2	7 1/8	11	4	15 1/2	21	6 5/8	1	1	10 3/4	2
G3315	Giblet	G3415	Ginfeng	15	25 1/4	23	8 3/4	16 1/2	7 1/8	11	4	16 1/2	22 1/4	6 5/8	1	1	10 3/4	2
G3316	Giddly	G3416	Gingerly	16	27 1/4	24	9 1/4	17 3/4	7 1/8	11	4	16 1/4	23 1/2	6 5/8	1 1/8	1 1/8	10 3/4	2
G3318	Giddy	G3418	Gingham	18	33 1/4	28	13 1/2	19 3/4	9 1/8	14	4	19 1/4	25	8 7/8	1 1/8	1 1/8	13 3/4	2
G3320	Gift	G3420	Giraffe	20	36 1/4	30	14 1/2	22	9 3/8	14	4	21 3/4	27 1/2	9 1/8	1 3/8	1 3/8	13 3/4	2
G3324	Gifted	G3424	Gird	24	42 1/2	34	16 1/2	26	9 5/8	14 1/4	4	25 1/2	32	9 3/8	1 1/4	1 1/4	14	2
G3330	Gig	G3430	Girder	30	52	40	19 1/2	32 1/2	10	15 1/2	4	31 3/4	38 3/4	9 3/4	1 3/8	1 3/8	15 1/4	3
G3336	Gigantic	G3436	Girdle	36	62 1/2	50	24	38 1/2	11 1/2	18 3/8	5	38	46	11 1/4	1 1/2	1 1/2	18 3/8	3
G3342	Giggle	G3442	Girl	42	71 3/4	56	27	44 3/4	11 1/2	18 3/8	5	44 1/2	53	11 5/8	1 5/8	1 5/8	18 3/8	3
G3348	Gigot	G3448	Girlhood	48	81	62	30	51	12 1/8	18 3/8	5	50 1/2	59 1/2	11 7/8	1 5/8	1 5/8	18 3/8	3
G3354	Gild	G3454	Girlish	54	90 1/4	68	33	57 1/4	12 1/8	18 3/8	5	56 1/2	66 1/4	12 1/4	1 3/4	1 3/4	18 3/8	3
G3360	Gilded	G3460	Girth	60	99 1/4	74	36	63 1/2	12 1/2	20 3/8	5	62 3/4	73	12 1/4	1 3/4	1 3/4	19 7/8	4
G3366	Gildina	G3466	Gist	66	108 3/4	80	39	69 3/4	13	20 3/8	5	68 3/4	80	12 3/4	1 3/4	1 3/4	20 3/8	4
G3372	Gill	G3472	Give	72	118	86	42	76	13 1/8	20 3/8	5	74 3/4	86 1/2	12 7/8	1 7/8	1 7/8	20 3/8	4
G3378	Gilt	G3478	Given	78	128	92	45	83	13 3/8	20 3/8	5	80 3/4	93	13 3/8	2	2	20 3/8	4
G3384	Gilthead	G3484	Giver	84	137	100	48	89	14 3/8	22 3/8	6	86 3/4	99 3/4	14 1/2	2	2	22 3/8	4
G3396	Gimbal	G3496	Gizzard	96	155	112	54	101	15 1/4	24 1/2	6	98 3/4	113 1/4	15	2 1/4	2 1/4	24 1/4	5

NOS. G53-54 "TESTITE" ADJUSTABLE SIDE, TOP AND BOTTOM WEDGES, RECTANGULAR SLIDE

Flange frame		Flange and spigot frame		Gate size	A	B	C	D	F	G	H	J	K	L	M	N	P	R	S	T
No.	Code	No.	Code																	
G5320	Guard	G5420	Gulf	20	36 1/2	30	14 1/2	22	9 3/8	14	4	21 3/8	27 1/2	9 1/8	1 3/8	1 3/8	13 3/4	2	2	2
G5324	Guardian	G5424	Gull	24	42 1/2	34	16 1/2	26	9 5/8	14 1/4	4	25 1/2	32	9 3/8	1 1/4	1 1/4	14	2	2	2
G5330	Gudgeon	G5430	Gullet	30	52	40	19 1/2	32 1/2	10	15 1/2	4	31 3/4	38 3/4	9 3/4	1 3/8	1 3/8	15 1/4	2	2	2
G5336	Guess	G5436	Gully	36	62 1/2	50	24	38 1/2	11 1/2	18 3/8	5	38	46	11 1/4	1 1/2	1 1/2	18 3/8	2	2	2
G5342	Guest	G5442	Gulp	42	71 3/4	56	27	44 3/4	11 1/2	18 3/8	5	44 1/2	53	11 5/8	1 5/8	1 5/8	18 3/8	2	2	2
G5348	Guide	G5448	Gum	48	81	62	30	51	12 1/8	18 3/8	5	50 1/2	59 1/2	11 7/8	1 5/8	1 5/8	18 3/8	2	2	2
G5354	Guile	G5454	Gunner	54	90 1/4	68	33	57 1/4	12 1/8	18 3/8	5	56 1/2	66 1/4	12 1/4	1 3/4	1 3/4	18 3/8	2	2	2
G5360	Guilt	G5460	Gurgle	60	99 1/4	74	36	63 1/2	12 1/2	20 3/8	5	62 3/4	73	12 1/4	1 3/4	1 3/4	19 7/8	2	2	2
G5366	Guilty	G5466	Gusher	66	108 3/4	80	39	69 3/4	13	20 3/8	5	68 3/4	80	12 3/4	1 3/4	1 3/4	20 3/8	2	2	2
G5372	Guinea	G5472	Gust	72	118	86	42	76	13 1/8	20 3/8	5	74 3/4	86 1/2	12 7/8	1 7/8	1 7/8	20 3/8	2	2	2
G5378	Guise	G5478	Gutter	78	128	92	45	83	13 3/8	20 3/8	5	80 3/4	93	13 3/8	2	2	20 3/8	2	2	2
G5384	Guitar	G5484	Guy	84	137	100	48	89	14 3/8	22 3/8	6	86 3/4	99 3/4	14 1/2	2	2	22 3/8	4	4	4
G5396	Gulch	G5496	Guzzle	96	155	112	54	101	15 1/4	24 1/2	6	98 3/4	113 1/4	15	2 1/4	2 1/4	24 1/4	4	4	4

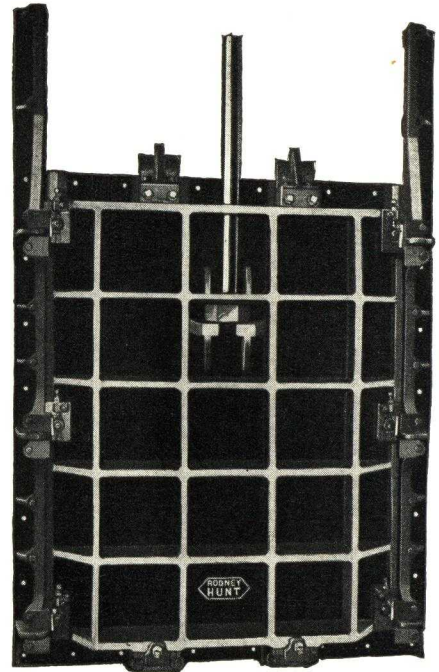
Dimensions given in inches

"TESTITE" RECTANGULAR SLUICE GATES

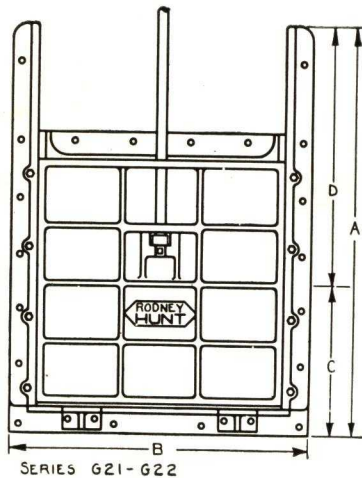
The details of construction evident in the illustration at the right and in the diagram on the pages reveal refinements and reinforcements peculiar to "Rodney Hunt" Gates only. Engineers frequently comment on the fact that these gates are extra substantial. Frequent tests of castings used reveal very high grade iron of unusual strength. They also are built with "That Extra Factor of Safety."

No. G21-22 gate is for installation when pressure is great enough to force the disc to a water tight seat and where it is never in the reverse direction tending to force the slide away from the frame.

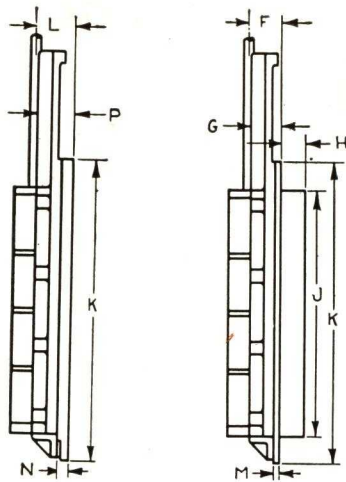
They are designed for a maximum head of 100 ft. and have wide brass facings on both frame and slide. Stops on the frame limit the slide travel. Where the pressure is too light to keep the slide tight, our Series G41-42 gates should be used. If it is desired to have the gate tight under back pressure, the Series G63-64 should be selected.



G63-64 "Testite"
Rectangular Sluice Gate



SERIES G21-G22



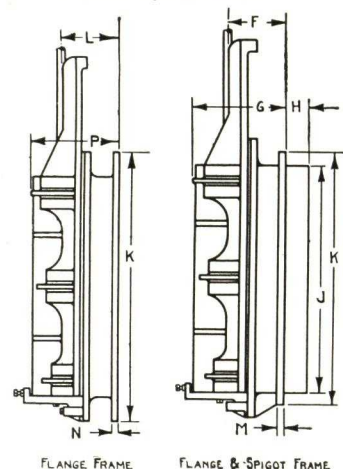
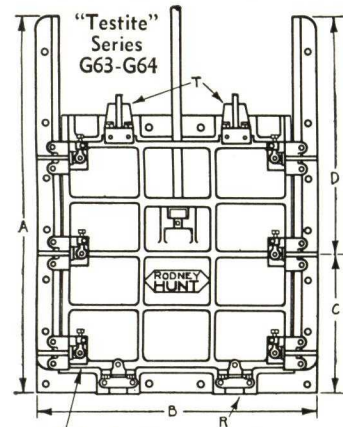
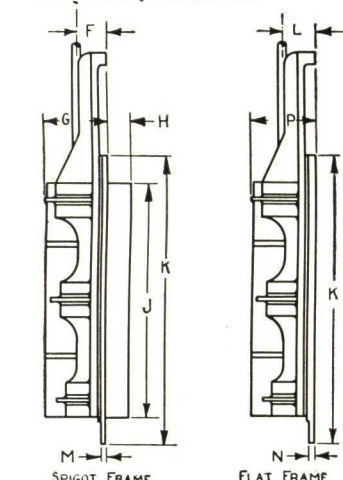
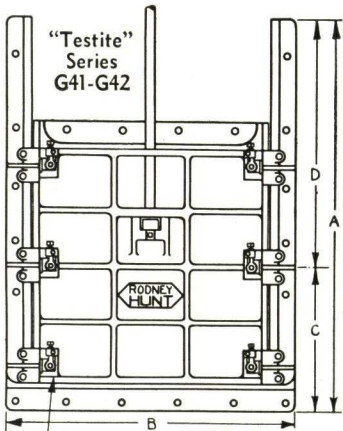
FLAT FRAME

SPIGOT FRAME

"TESTITE" NOS. G21-22 WEDGELESS TYPE RISING STEM RECTANGULAR SLUICE GATES

Flat frame		Spigot frame		Gate size	A	B	C	D	F	G	H	J	K	L	M	N	P
No.	Code	No.	Code														
G210606	Dab	G220606	Deign	6x6	14	14	7	7	3 1/2	3 3/8	4	7	14	4 1/4	7 1/8	1 5/8	4 1/8
G210808	Dabble	G220808	Delay	8x8	17	16	8	9	3 1/2	3 3/8	4	9	16	4 1/4	7 1/8	1 5/8	4 1/8
G211010	Dad	G221010	Dell	10x10	20 1/2	18	9	11 1/2	3 1/2	3 3/8	4	11	18	4 1/4	7 1/8	1 5/8	4 1/8
G211212	Dagger	G221212	Den	12x12	23 1/2	20	10	13 1/2	3 1/2	3 3/8	4	13 1/8	20	4 1/4	7 1/8	1 5/8	4 1/8
G211220	Daily	G221220	Dent	12x20	37	20	15	22	3 1/2	3 3/8	4	21 3/8	30	4 1/4	7 1/8	1 5/8	4 1/8
G211414	Dainty	G221414	Depart	14x14	26 1/2	22	11	15 1/2	3 1/2	3 3/8	4	15 1/8	22	4 1/4	7 1/8	1 5/8	4 1/8
G211616	Dairy	G221616	Depot	16x16	39 3/4	24	12	17 3/4	3 1/2	3 3/8	4	17 1/4	24	4 1/4	7 1/8	1 5/8	4 1/8
G211624	Daisy	G221624	Derrick	16x24	43	26	17	26	3 1/2	3 3/8	4	25 1/2	34	4 1/4	7 1/8	1 5/8	4 1/8
G211818	Dale	G221818	Desert	18x18	33 3/4	28	14	19 3/4	4 1/4	4 1/4	4	19 1/4	28	5 1/8	1	2	5
G211824	Dally	G221824	Desk	18x24	43	28	17	26	4 1/4	4 1/4	4	25 1/2	34	5 1/8	1	2	5
G211836	Dam	G221836	Deuce	18x36	63 1/2	32	25	38 1/2	5 1/2	5 1/4	5	38	50	6 1/8	1 1/4	2 1/2	6 1/2
G212020	Damage	G222020	Dew	20x20	37	30	15	22	4 1/4	4 1/4	4	21 3/8	30	5 1/4	1	2	5
G212024	Damask	G222024	Dial	20x24	43	30	17	26	4 1/4	4 1/4	4	25 1/2	34	5 1/4	1	2	5
G212036	Dame	G222036	Dice	20x36	63 1/2	34	25	38 1/2	5 1/2	5 1/4	5	38	50	6 1/8	1 1/4	2 1/2	6 1/2
G212424	Damp	G222424	Dicker	24x24	43	34	17	26	4 1/4	4 1/4	4	25 1/2	34	5 1/4	1	2	5
G212436	Damper	G222436	Diction	24x36	63 1/2	38	25	38 1/2	5 1/2	5 1/4	5	38	50	6 1/8	1 1/4	2 1/2	6 1/2
G212448	Damsel	G222448	Die	24x48	82	38	31	51	5 1/2	5 1/4	5	50 1/2	62	6 3/4	1 1/4	2 1/2	6 1/2
G212460	Dance	G222460	Diet	24x60	100 1/2	42	37	63 1/2	5 1/2	5 1/4	5	62 3/4	74	7 1/4	1 1/4	2 1/2	6 1/2
G213030	Dandy	G223030	Differ	30x30	52 1/2	40	20	32 1/2	4 1/2	4 1/4	4	31 3/4	40	5 1/2	1	2	5
G213036	Danger	G223036	Dig	30x36	63 1/2	44	25	38 1/2	5 1/2	5 1/4	5	38	50	6 1/8	1 1/4	2 1/2	6 1/2
G213048	Dangle	G223048	Digit	30x48	82	44	31	51	5 1/2	5 1/4	5	50 1/2	62	6 3/4	1 1/4	2 1/2	6 1/2
G213060	Dapper	G223060	Dimmed	30x60	100 1/2	44	37	63 1/2	5 1/2	5 1/4	5	62 3/4	74	7 1/4	1 1/4	2 1/2	6 1/2
G213624	Dare	G223624	Din	36x24	43	46	17	26	4 1/2	4 1/4	4	25 1/2	34	5 1/4	1	2	5
G213636	Daring	G223636	Dingy	36x36	63 1/2	50	25	38 1/2	5 1/2	5 1/4	5	38	50	6 1/8	1 1/4	2 1/2	6 1/2
G213642	Dark	G223642	Dinner	36x42	72 3/4	50	28	44 3/4	5 1/2	5 1/4	5	44 1/8	56	6 3/4	1 1/4	2 1/2	6 1/2
G213648	Darling	G223648	Dip	36x48	82	50	31	51	5 1/2	5 1/4	5	50 1/2	62	6 3/4	1 1/4	2 1/2	6 1/2
G213660	Dart	G223660	Dipper	36x60	100 1/2	50	37	63 1/2	5 1/2	5 1/4	5	62 3/4	74	7 1/4	1 1/4	2 1/2	6 1/2
G213672	Dash	G223672	Dire	36x72	119	50	43	76	6	5 1/4	5	74 3/4	86	7 1/4	1 1/4	2 1/2	6 1/2
G214242	Dashing	G224242	Direct	42x42	72 3/4	56	28	44 3/4	5 1/2	5 1/4	5	44 1/8	56	6 3/4	1 1/4	2 1/2	6 1/2
G214260	Data	G224260	Dirt	42x60	100 1/2	56	37	63 1/2	5 1/2	5 1/4	5	62 3/4	74	7 1/4	1 1/4	2 1/2	6 1/2
G214272	Date	G224272	Dish	42x72	119	56	43	76	6	5 1/4	5	74 3/4	86	7 1/4	1 1/4	2 1/2	6 1/2
G214836	Daub	G224836	Disk	48x36	63 1/2	62	25	38 1/2	5 1/2	5 1/4	5	38	50	6 1/8	1 1/4	2 1/2	6 1/2
G214848	Daughter	G224848	Dismal	48x48	82	62	31	51	5 1/2	5 1/4	5	50 1/2	62	6 3/4	1 1/4	2 1/2	6 1/2
G214860	Daunt	G224860	Ditch	48x60	100 1/2	62	37	63 1/2	6	5 1/4	5	62 3/4	74	7 1/4	1 1/4	2 1/2	6 1/2
G214872	Dawn	G224872	Ditty	48x72	119	62	43	76	6	5 1/4	5	74 3/4	86	7 1/4	1 1/4	2 1/2	6 1/2
G214884	Day	G224884	Divan	48x84	139	64	50	89	7 1/4	6	6	86 3/4	100	8 3/4	1 1/2	2 1/2	7 1/2
G214896	Daze	G224896	Dizzy	48x96	157	64	56	101	7 1/4	6	6	98 3/4	112	8 3/4	1 1/2	2 1/2	7 1/2
G215454	Dazzle	G225454	Doobin	54x54	91 1/4	68	34	57 1/4	5 1/2	5 1/4	5	56 3/8	68	7 1/4	1 1/2	2 1/2	6 1/2
G216036	Deacon	G226036	Dock	60x36	63 1/2	74	25	38 1/2	5 1/2	5 1/4	5	38	50	6 1/8	1 1/4	2 1/2	6 1/2
G216048	Dead	G226048	Doctor	60x48	82	74	31	51	6	5 1/4	5	50 1/2	62	6 3/4	1 1/4	2 1/2	6 1/2
G216060	Deaf	G226060	Dodge	60x60	100 1/2	74	37	63 1/2	6	5 1/4	5	62 3/4	74	7 1/4	1 1/4	2 1/2	6 1/2
G216072	Deal	G226072	Does	60x72	119	74	43	76	6	5 1/4	5	74 3/4	86	7 1/4	1 1/4	2 1/2	6 1/2
G216084	Dean	G226084	Dog	60x84	139	76	50	89	6 3/8	6	6	86 3/4	100	8 3/4	1 1/2	2 1/2	7 1/2
G216096	Dear	G226096	Doily	60x96	157	76	56	101	7 1/4	6	6	98 3/4	112	8 3/4	1 1/2	2 1/2	7 1/2
G216666	Debate	G226666	Doll	66x66	109 3/4	80	40	69 3/4	6 1/4	5 1/4	5	68 3/4	80	7 1/4	1 1/4	2 1/2	6 1/2
G217248	Debit	G227248	Dome	72x48	82	86	31	51	6	5 1/4	5	50 1/2	62	6 3/4	1 1/4	2 1/2	6 1/2
G217272	Debt	G227272	Doom	72x72	119	86	43	76	6	5 1/4	5	74 3/4	86	7 1/4	1 1/4	2 1/2	6 1/2
G217284	Debtor	G227284	Door	72x84	139	88	50	89	7 1/4	6	6	86 3/4	100	8 3/4	1 1/2	2 1/2	7 1/2
G217296	Decent	G227296	Dope	72x96	157	88	56	101	7 1/4	6	6	98 3/4	112	8 3/4	1 1/2	2 1/2	7 1/2
G217878	Deck	G227878	Dory	78x78	129	92	46	83	6 1/2	5 1/4	5	80 3/4	88	7 3/4	1 1/4	2 1/2	6 1/2
G218460	Decoy	G228460	Dosage	84x60	100 1/2	98	37	63 1/2	6 1/2	5 1/4	5	62 3/4	74	7 1/4	1 1/4	2 1/2	6 1/2
G218484	Decree	G228484	Dot	84x84	139	100	50	89	7 3/4	6	6	86 3/4	100	8 3/4	1 1/2	2 1/2	7 1/2
G218496	Deed	G228496	Double	84x96	157	100	56	101	7 3/4	6	6	98 3/4	112	8 3/4	1 1/2	2 1/2	7 1/2
G2184108	Deem	G2284108	Doubt	84x108	175	100	62	113	8	6	6	110 3/4	124	9 1/4	1 1/2	2 1/2	7 1/2
G219648	Deep	G229648	Dough	96x48	82	110	31	51	6 3/8	5 1/4	5	50 1/2	62	6 3/4	1 1/4	2 1/2	6 1/2
G219660	Defeat	G229660	Dove	96x60	100 1/2	110	37	63 1/2	6 1/2	5 1/4	5	62 3/4	74	7 1/4	1 1/4	2 1/2	6 1/2
G219672	Defy	G229672	Down	96x72	119	110	43	76	6 3/4	5 1/4	5	74 3/4	86	7 1/4	1 1/4	2 1/2	6 1/2
G219696	Degree	G229696	Dowry	96x96	157	112	56	101	8	6	6	98 3/4	112	8 3/4	1 1/2	2 1/2	7 1/2

Dimensions given in inches



"TESTITE" SERIES G41-G42 RECTANGULAR SLUICE GATES

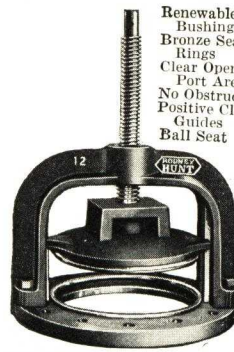
Flat frame		Spigot frame		Gate size	A	B	C	D	F	G	H	J	K	L	M	N	P	S	
No.	Code	No.	Code																
G 410606	Babble	G 420606	Barber	6x 6	14	14	7	7	3 1/2	6 1/4	4	7	14	4 1/4	7 1/2	1 1/2	7	1	1
G 410808	Babe	G 420808	Bard	8x 8	17	16	8	9	3 1/2	6 1/4	4	9	16	4 1/4	8 1/2	1 1/2	8	1	1
G 411010	Back	G 421010	Barely	10x 10	20 1/2	18	9	11 1/2	3 1/2	6 1/4	4	11	18	4 1/4	10 1/2	1 1/2	10	1	1
G 411212	Bacon	G 421212	Bargain	12x 12	21 1/2	20	10	11 1/2	3 1/2	7 1/2	4	13 1/2	20	4 1/4	12 1/2	1 1/2	12	1	1
G 411220	Bad	G 421220	Barge	12x 20	36	20	14	22	3 1/2	7 1/2	4	21 1/2	28	4 1/4	15 1/2	1 1/2	15	1	1
G 411414	Badge	G 421414	Bark	14x 14	26 1/2	22	11	15 1/2	3 1/2	7 1/2	4	15 1/2	22	4 1/4	17 1/2	1 1/2	17	1	1
G 411616	Baffle	G 421616	Barlow	16x 16	39 3/4	24	12	17 3/4	3 1/2	9	4	17 1/4	24	4 1/4	19 1/2	1 1/2	19	1	1
G 411624	Bag	G 421624	Barn	16x 24	43	24	17	26	3 1/2	9	4	25 1/2	34	4 1/4	21 1/2	1	2	10	2
G 411818	Bail	G 421818	Barrack	18x 18	33 3/4	28	14	19 3/4	4 1/8	9	4	19 1/4	28	5 1/4	1	2	10	2	2
G 411824	Bait	G 421824	Barrel	18x 24	43	28	17	26	4 1/4	12 1/2	4	25 1/2	34	5 1/4	1	2	10	2	2
G 411836	Bake	G 421836	Barren	18x 36	63 1/2	32	25	38 1/2	5	9	4	38	50	6 1/2	1 1/4	2 1/2	13 3/4	3	3
G 412020	Bald	G 422020	Base	20x 20	37	30	15	22	4 1/4	9	4	21 1/2	28	5 1/4	1	2	10	2	2
G 412036	Ball	G 422036	Basin	20x 36	63 1/2	32	25	38 1/2	5 1/2	12 1/2	4	38	50	6 1/2	1 1/4	2 1/2	13 3/4	3	3
G 412424	Ballet	G 422424	Basking	24x 24	43	34	17	26	4 1/4	9	4	25 1/2	34	5 1/4	1	2	10	2	2
G 412436	Balloon	G 422436	Basket	24x 36	63 1/2	38	25	38 1/2	5 1/2	12 1/2	4	38	50	6 1/2	1 1/4	2 1/2	13 3/4	3	3
G 412448	Balot	G 422448	Bass	24x 48	82	38	31	51	5 1/2	12 1/2	5	50 1/2	62	6 1/2	1 1/4	2 1/2	13 3/4	3	3
G 412460	Balm	G 422460	Baste	24x 60	100 1/2	38	37	63 1/2	5 1/2	13 3/4	5	62 1/2	74	7	1 1/4	2 1/2	15	4	4
G 413030	Balsam	G 423030	Bat	30x 30	52 1/2	40	20	32 1/2	4 1/2	10	4	31 1/4	40	5 1/2	1	2	11	3	3
G 413036	Ban	G 423036	Batch	30x 36	63 1/2	44	25	38 1/2	5 1/2	12 1/2	5	38	50	6 1/2	1 1/4	2 1/2	13 3/4	3	3
G 413048	Banal	G 423048	Bath	30x 48	82	44	31	51	5 1/2	12 1/2	5	50 1/2	62	6 1/2	1 1/4	2 1/2	13 3/4	3	3
G 413624	Bandit	G 423624	Battle	36x 24	43	46	17	26	4 1/2	9	5	25 1/2	34	5 1/4	1	2	10	2	2
G 413636	Bang	G 423636	Baulk	36x 36	63 1/2	48	25	38 1/2	5 1/2	12 1/2	5	38	50	6 1/2	1 1/4	2 1/2	13 3/4	3	3
G 413648	Banjo	G 423648	Being	36x 48	82	50	31	51	5 1/2	12 1/2	5	50 1/2	62	6 1/2	1 1/4	2 1/2	13 3/4	3	3
G 413660	Bank	G 423660	Beach	36x 60	100 1/2	50	37	63 1/2	5 1/2	13 3/4	5	62 1/2	74	7	1 1/4	2 1/2	15	4	4
G 413672	Banner	G 423672	Beacon	36x 72	119	50	43	76	6	13 3/4	5	74 1/4	86	7 1/4	1 1/4	2 1/2	15	4	4
G 414242	Banquet	G 424242	Bead	42x 42	72 3/4	56	28	44 3/4	5 1/2	12 1/2	5	44 1/4	56	6 1/2	1 1/4	2 1/2	15	4	4
G 414260	Banter	G 424260	Beak	42x 60	100 1/2	56	37	63 1/2	5 1/2	13 3/4	5	62 1/2	74	7	1 1/4	2 1/2	15	4	4
G 414272	Bar	G 427272	Beaming	42x 72	119	56	43	76	6	13 3/4	5	74 1/4	86	7 1/4	1 1/4	2 1/2	15	4	4
G 414836	Bean	G 424836	Below	48x 36	63 1/2	62	25	38 1/2	5 1/2	12 1/2	5	38	50	6 1/2	1 1/4	2 1/2	13 3/4	3	3
G 414848	Bear	G 424848	Below	48x 48	82	62	31	51	5 1/2	12 1/2	5	50 1/2	62	6 1/2	1 1/4	2 1/2	13 3/4	3	3
G 414860	Beard	G 424860	Bench	48x 60	100 1/2	62	37	63 1/2	6	13 3/4	5	62 1/2	74	7 1/4	1 1/4	2 1/2	15	4	4
G 414872	Beat	G 424872	Bend	48x 72	119	62	43	76	6	13 3/4	5	74 1/4	86	7 1/4	1 1/4	2 1/2	15	4	4
G 414884	Beau	G 424884	Bequest	48x 84	139	64	50	89	7 1/4	15 1/4	6	86 1/4	100	8 1/4	1 1/2	3	17 1/2	4	4
G 414896	Beauty	G 424896	Berry	48x 96	157	64	56	101	7 3/8	17	6	88 3/4	112	8 1/2	1 1/2	3	18 1/2	5	5
G 415454	Beaver	G 425454	Berth	54x 54	91 1/4	68	34	57 1/4	5 1/2	12 1/2	5	56 1/2	68	7 1/4	1 1/4	2 1/2	13 3/4	3	3
G 416036	Because	G 426036	Beside	60x 36	63 1/2	74	25	38 1/2	5 1/2	12 1/2	5	38	50	6 1/2	1 1/4	2 1/2	13 3/4	3	3
G 416048	Beckon	G 426048	Bestow	60x 48	82	74	31	51	6	12 1/2	5	60 1/2	62	7 1/4	1 1/4	2 1/2	13 3/4	3	3
G 416060	Become	G 426060	Bet	60x 60	100 1/2	74	37	63 1/2	6	13 3/4	5	62 1/2	74	7 1/4	1 1/4	2 1/2	15	4	4
G 416072	Bed	G 426072	Better	60x 72	119	74	43	76	6 1/2	13 3/4	5	74 1/4	86	7 1/4	1 1/4	2 1/2	15	4	4
G 416084	Befall	G 426084	Between	60x 84	139	76	50	89	6 3/8	15 1/4	6	86 1/4	100	8 1/2	1 1/2	3	17 1/2	4	4
G 416096	Beef	G 426096	Beware	60x 96	157	76	56	101	7 1/2	17	6	88 3/4	112	9	1 1/2	3	18 1/2	5	5
G 416666	Beer	G 426666	Beyond	66x 66	109 3/4	80	40	69 3/4	6 1/4	13 3/4	5	68 3/4	80	7 1/4	1 1/4	2 1/2	15	4	4
G 417248	Befriend	G 427248	Bias	72x 48	82	86	31	51	6	12 1/2	5	50 1/2	62	7 1/4	1 1/4	2 1/2	13 3/4	3	3
G 417272	Beetle	G 427272	Bib	72x 72	119	86	43	76	6 1/2	13 3/4	5	74 1/4	86	7 1/4	1 1/4	2 1/2	15	4	4
G 417284	Before	G 427284	Bicker	72x 84	139	88	50	89	7 1/2	15 1/4	6	86 1/4	100	9	1 1/2	3	17 1/2	4	4
G 417296	Beg	G 427296	Bid	72x 96	157	88	56	101	7 3/8	17	6	88 3/4	112	9 1/4	1 1/2	3	18 1/2	5	5
G 417878	Beggar	G 427878	Bide	78x 78	129	92	46	83	6 1/2	13 3/4	5	80 1/4	88	7 1/4	1 1/4	2 1/2	15	4	4
G 418460	Begin	G 428460	Big	84x 60	100 1/2	98	37	63 1/2	6 1/2	13 3/4	6	62 1/2	74	7 1/4	1 1/4	2 1/2	15	4	4
G 418484	Behalf	G 428484	Bigot	84x 84	139	100	50	89	7 3/8	15 1/4	6	86 1/4	100	9 1/4	1 1/2	3	17 1/2	4	4
G 418496	Behold	G 428496	Bile	84x 96	157	100	56	101	7 3/8	17	6	88 3/4	112	9 1/4	1 1/2	3	18 1/2	5	5
G 419648	Belief	G 429648	Billion	96x 48	82	110	31	51	6 1/2	12 1/2	5	50 1/2	62	7 1/4	1 1/4	2 1/2	13 3/4	3	3
G 419660	Bell	G 429660	Billow	96x 60	100 1/2	110	37	63 1/2	6 1/2	13 3/4	5	62 1/2	74	7 1/4	1 1/4	2 1/2	15	4	4
G 419672	Bellow	G 429672	Bird	96x 72	119	110	43	76	6 1/2	13 3/4	5	74 1/4	86	8	1 1/4	2 1/2	15	4	4
G 419696	Belong	G 429696	Bind	96x 96	157	112	56	101	8	17	6	98 3/4	112	9 1/4	1 1/2	3	18 1/2	5	5

PLUG OR MUD VALVES

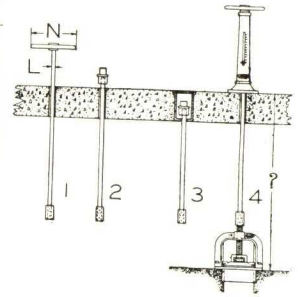
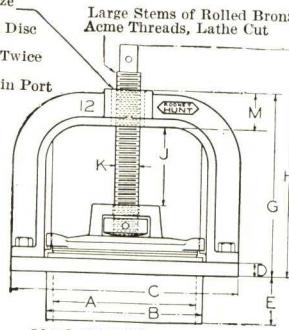
Used for draining tanks, forebays, flumes, pressure boxes, etc. through a bottom opening. There are no recesses for mud or debris to collect and prevent tight closing.

The castings are of the best cast iron with an exceptional tensile strength. The disc is heavy and lugs on the sides engage loosely with guide ribs on yoke—assuring positive seating of the disc.

The easily renewable disc ring and seat ring are both of hard bronze, and are screwed in place. They are easily renewable. The seat ring projects only slightly above the flange, and allows complete drainage. Rolled bronze stems are of ample size, and have Acme threads, lathe cut. These stems work in a hard bronze bushing, which is screwed into the yoke, and can be renewed. Can be furnished with flange to attach to pipe, with a short spigot for concrete installations, or with long spigot for use with hub end pipe.



Renewable Bronze Bushing
Bronze Seat and Disc Rings
Clear Opening—Twice Port Area
No Obstructions in Port
Positive Closing Guides
Ball Seat



PLUG VALVES

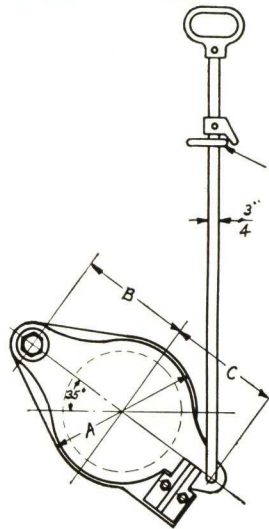
A Size	B	C	D	E	G	H	J	K	L	N	Thds.	Turns to open	List prices
4	5	9	3 1/4	3 1/2	10 3/8	12 1/2	2 1/2	1 1/8	1	9	4	10	\$ 44.00
6	7	11	3 1/2	3 3/4	11 1/2	13 1/2	3	1 1/8	1 1/8	12	4	12	56.00
8	9	13 1/2	3 3/4	4	11 3/4	14 1/2	4	1 1/8	1 1/8	14	3 1/2	14	70.00
10	11	16	4	4 1/2	12 5/8	15 3/8	5	1 1/8	1 1/8	16	3	17	88.00
12	13 1/8	19	4 1/2	5	13 1/4	16 1/4	6	1 1/8	1 1/8	18	3	18	108.00
14	15 1/4	21	5	6	14 1/4	17 1/4	7	1 1/8	1 1/8	20	3	21	130.00
16	17 1/2	23 1/2	5 1/2	6 1/2	15 1/4	18 1/4	8	1 1/8	1 1/8	22	3	24	155.00
18	19 1/2	25	6	7	16 1/4	19 1/4	9	1 1/8	1 1/8	24	3	27	180.00
20	21 1/2	27 1/2	6 1/2	7 1/2	17 1/4	20 1/4	10	1 1/8	1 1/8	26	3	30	210.00
24	26	32	7 1/2	8 1/2	19 1/4	22 1/4	12	1 1/8	1 1/8	30	3	36	300.00

FULL OPENING SHEAR GATES

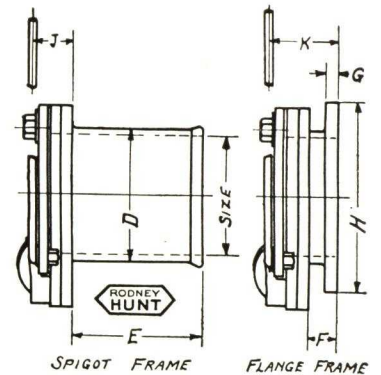
"RODNEY HUNT" Shear Gates are full opening and are bronze mounted throughout. Both the frame and the disc have bronze rings and the disc also has a bronze pin with bronze bushing and a bronze stop.

SHEAR GATES

Size	A	B	C	D	E	F	G	H	J	K	List price
4	6 1/2	4 1/2	5 1/4	5	7	2 1/4	3 1/4	9	3	5 1/4	\$ 30.00
6	8 1/2	6 3/4	6 1/2	7	8	2 1/4	3 1/4	11	3	5 1/4	40.00
8	10 1/2	7 3/4	7 1/2	9	10	2 1/4	3 1/4	13 1/2	3 1/8	5 1/4	60.00
10	12 1/2	9 1/4	9 1/4	11	12	2 3/4	3 1/4	16	3 3/8	6 1/8	80.00
12	14 1/2	10 3/4	10 3/4	13 1/8	14	3	3 1/4	19	4	7 1/4	100.00
14	16 3/4	12	11 3/4	15 1/4	16	3 1/4	3 1/4	21	4 1/8	7 1/4	120.00
16	18 1/2	14 1/4	13 1/4	17 1/4	18	3 3/4	3 1/4	23 1/2	4 1/2	7 1/4	160.00
18	20 1/2	16 1/4	15 1/4	19 1/4	20	4	3 1/4	25	4 3/4	8 1/4	200.00
20	22 1/2	18 1/4	17 1/4	21 1/4	22	4 1/4	3 1/4	27 1/2	4 3/4	8 1/4	250.00
24	26 1/2	21 1/2	20 3/4	25 3/4	26	4 1/4	3 1/4	32	4 3/4	8 1/4	300.00



WALL LOOP

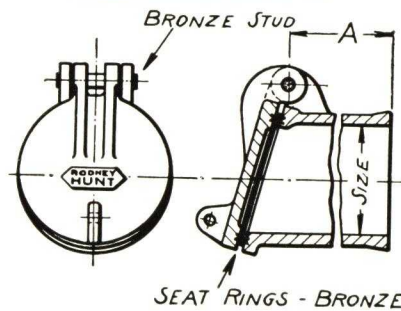


SPIGOT FRAME

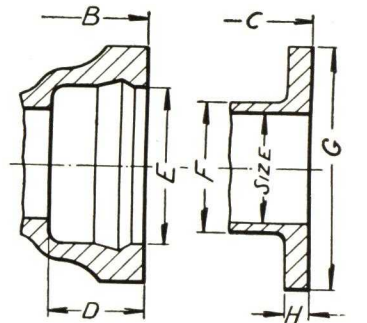
FLANGE FRAME

"RODNEY HUNT" FLAP VALVES

These flap valves are bronze mounted throughout, both frame and disc having bronze rings and the pin being also of bronze. They are simple in design, rugged and will give extraordinarily long service. They open easily under very slight difference in head. Standard sizes are carried in stock and special sizes can be built to specifications.



SEAT RINGS - BRONZE



SPIGOT END

BELL END

FLANGE END



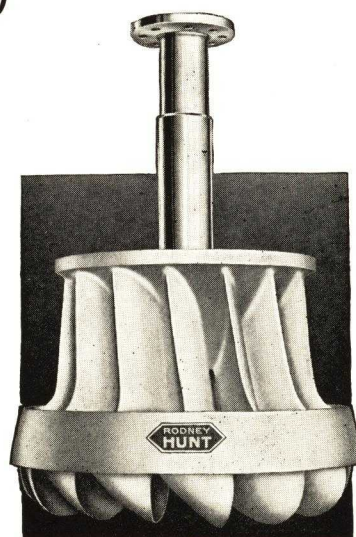
Size	A	B	C	D	E	F	G	H	List prices	
									Flgd.	Bell or Spigot
4	9 3/4	5 3/4	4	4	5.7	4 7/8	9	3/4	\$ 18.00	\$ 16.00
6	10	6	5	4	7.8	7	11	1 1/8	23.00	21.00
8	10 1/2	6 1/4	5 1/4	4	10.0	9	13 1/2	1	30.00	28.00
10	11	7	5 1/2	4	12.1	11	16	1	40.00	38.00
12	11 1/2	7 1/4	6 1/4	4	14.2	13	19	1	52.00	50.00
14	11 1/2	7 1/4	6 1/4	4	16.45	15 1/8	21	1	70.00	65.00
16	12	7 3/4	6 3/4	4	18.8	17 1/8	23 1/2	1 1/8	85.00	80.00
18	12	7 3/4	7 1/4	4	20.92	19 1/8	25	1 1/8	105.00	95.00
20	12 1/2	8 1/4	7 3/4	4	23.06	21 1/4	27 1/2	1 1/4	120.00	110.00
24	13	8 3/4	8 1/4	4	27.36	25 1/4	32	1 1/2	170.00	155.00
30	15	9 1/2	9 1/2	4	33.40	31 3/4	38 3/4	1 1/2	225.00	210.00

Dimensions in inches

RODNEY HUNT "HI-TEST" TURBINE WATER WHEELS

Since 1840

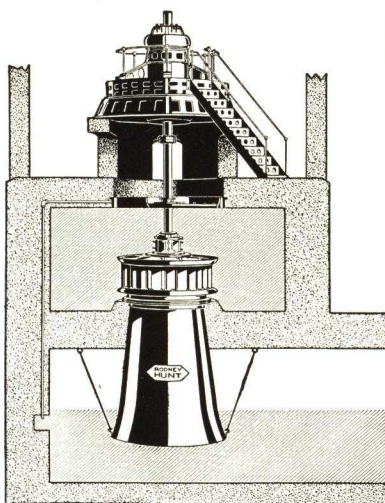
Over 70 years specializing equipment for Power Plants and Manufacturing Plants. Our staff of competent Hydraulic Engineers is at the service of our customers, and is in a position to offer valuable suggestions regarding application of our equipment to both usual and unusual conditions. We make special Vertical and Horizontal designs for Hydro-Electric and Direct Mill Drive. High and low speeds to suit heads up to 300 feet. Built for open, enclosed and spiral flumes. Also Water Turbine auxiliaries, including governors, shafting, pulleys, bulk heads and power transmitting equipment; bevel, cast and mortise gears.



Rodney Hunt Turbine Water Wheel
93.38% Efficiency

RODNEY HUNT OFFERS WATER POWER USERS THE FOLLOWING SERVICE:

- (1) High Efficiency Turbines.
- (2) Low Cost "change-overs."
- (3) Inspection Service.
- (4) Hydraulic Laboratory facilities.
- (5) Repair Parts under sprinkler protection for day and night service.
- (6) Experience of over 70 years specializing Water Wheels.



OFFICIAL HOLYOKE TEST—93.38% EFFICIENCY

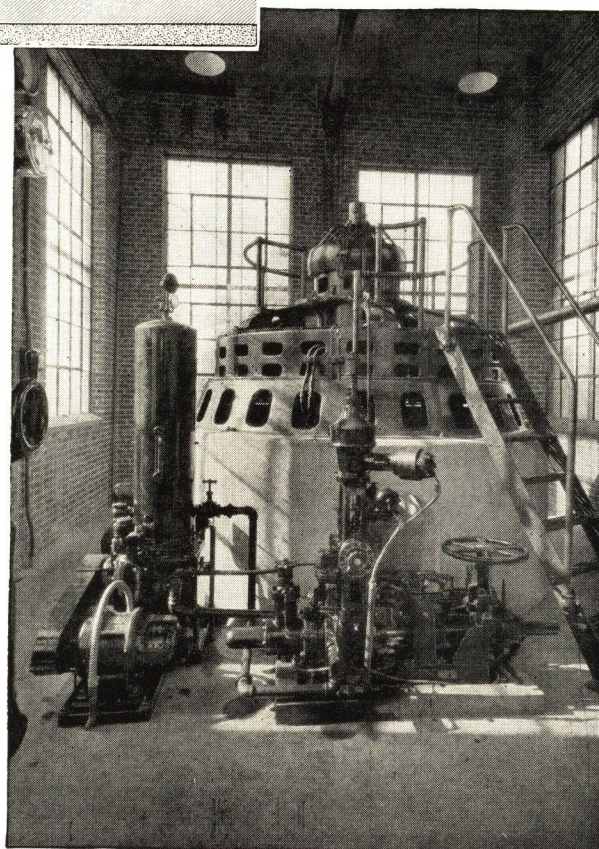
Unprecedented efficiency obtained on Rodney Hunt "Hi-Test" Turbine, May 13-14th, 1927—Test No. 3107.

Head (Feet)	Quantity of water C.F.S.	Hp. developed by turbine	Efficiency of wheel
16.25	100.46	172.43	93.17%
16.46	101.04	175.97	93.32%
16.27	100.11	172.44	93.38%
16.50	101.16	176.54	93.29%
16.32	100.57	173.10	93.02%

A large size Rodney Hunt "Hi-Test" Turbine of the above design would develop over 94.5% efficiency according to correction for difference in size.

Complete line of small wheels, including Brook Motors, Small Turbines, and Over-Shot Wheels. Correspondence solicited.

Interior of Generator Room,
E. E. Hilliard Co.'s Hydro-Station,
Buckland, Conn.
Rodney Hunt "Hi-Test" Turbine
Installation
C. T. MAIN, INC., Engineers





PROMINENT INSTALLATIONS
RODNEY HUNT WATER CONTROLLING APPARATUS

Filtration Plant—Indianapolis Water Co.

Todd's Shipyard—Robbins Dry Dock and Repair Co., Erie Basin, Brooklyn, N. Y.

Water Works—City of Nashville, Tenn.

Water Works—City of High Point, N. C.

Department of Public Works, City of Richmond, Va.

Echo Lake Dam—Newark, N. J.

Sewerage Treatment Plant, City of Norwalk, Ohio

Sewerage Disposal Plant, City of Coatesville, Pa.

Water Purification Plant—City of Ottawa, Canada

Ward's Island Sewerage Treatment Works—City of New York

Sewerage Disposal Plant—West Side Plants, City of Erie, Pa.

Sewerage Disposal Plant—City of Columbus, Ohio

Easterly Sewerage Treatment Plant—City of Cleveland, Ohio

Sewerage Treatment Plant, City of Akron, Ohio

Rapid Sand Filtration Plant, City of Lancaster, Pa.

Water Purification and Softening Plant, City of Findlay, Ohio



ESTABLISHED 1870

TROY ENGINE & MACHINE COMPANY

Manufacturers of Vertical and Horizontal Flat and Piston Valve Steam Engines, Generating Sets, Generators, Switchboards

TROY, PA.

SALES REPRESENTATIVES IN FIFTY PRINCIPAL CITIES

Engineering Service

Without obligation, we will analyze your operating conditions and requirements and submit practical, guaranteed recommendations, layouts, and specifications to cover the application of our equipment.

Advantages of Steam Engine Drive

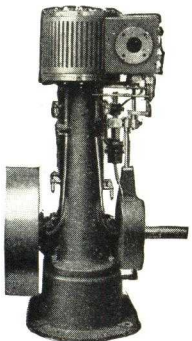
Steam engines are more economical and more reliable drives in most plants because their characteristics best suit requirements. Low steam consumption at all speeds meets normal exhaust steam needs. Since this low steam consumption is actually maintained throughout the life of the engine, the original heat balance is maintained. Accessibility and simple positive adjustments enable the average operator to easily keep the steam engine in first class condition. The more dependable continuous service and lower maintenance cost automatically increase profits. The high starting torque of steam engines, a necessity for many machines, is very desirable for all since the equipment can be quickly brought up to speed. Steam engines require no elaborate warming-up period which saves time and eliminates damage caused by rapid, unequal expansion. Steam engines offer no explosion hazard and are well suited for drives which come in contact with explosive gases.

The numerous advantages of steam engines are responsible for their selection by many leading corporations and engineers, such as the Western Electric Company, General Motors Corporation, the Standard Oil Companies, U. S. Steel Corporation, for driving stokers, draft fans, ventilating fans, blowers, compressors, generators, conveyors, pumps, mixers, driers, agitators, etc.

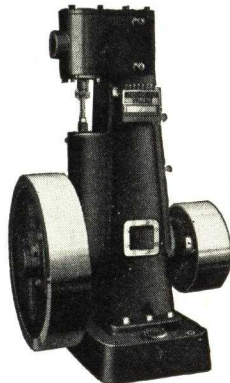
Troy-Engberg Engines

Troy-Engberg Engines are the result of forty years' specialized experience in steam engine manufacture. They are reliable, conservatively rated, of highest quality throughout, and long lived. They are self-oiling, center crank type with liberal bearing surfaces and parts, and heavy enclosed frames

equipped with oil and dust tight doors. Troy-Engberg Engines are built vertical and horizontal, for all conditions of pressure, super-heat and back pressure, and are

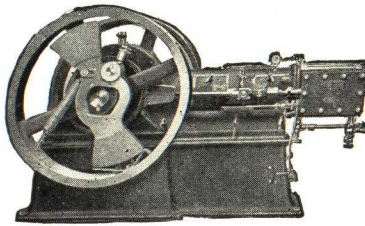


Standard Duty Vertical Steam Engine



Heavy Duty Vertical Steam Engine

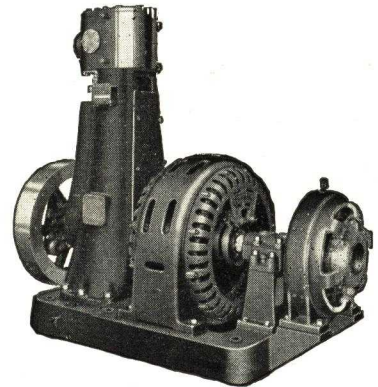
equipped with throttling or automatic governor, for direct connection, chain or belt drive for all operating conditions and safety requirements. Modern manufacturing methods, special machine tool equipment, and large production assure you attractive prices with years of reliable, economical service.



Horizontal Steam Engine

Troy-Engberg Generating Sets

Troy-Engberg Generating Sets are built in capacities from 3½ to 150 kw. with vertical or horizontal engine for direct current two or three-wire, and for alternating current with direct connected or belted type exciter for all standard voltage, frequency and phases.

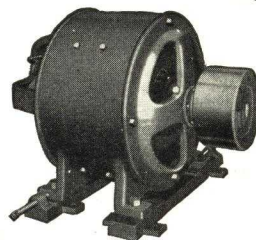


Generating Set

Furnished direct or alternating current, vertical or horizontal engine

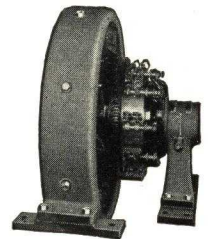
Engberg Generators

Engberg Generators are built in bracket type, direct current 1/3 to 60 kw., alternating current 1 to 63 kv-a.; and in engine type, direct current 15 to 75 kw., alternating current 30 to 75 kv-a., for direct connection to engines and motors or for belt drive. They are specially fitted to suit each particular installation.



Bracket Type Generator

Furnished direct or alternating current



Engine Type Generator

Furnished direct or alternating current

Guarantee

All Troy and Engberg Equipment is guaranteed to perform its specified service if operated with proper care, good lubricating oil, and intelligent adjustment. We will replace f.o.b. works, without further expense, any parts that may prove defective within one year from date of shipment, such parts being subject to our examination.

BUSCH-SULZER BROS.-DIESEL ENGINE CO.

Manufacturers of Stationary and Marine Diesels, Hydraulic Presses, High Pressure Compressors and Special Machinery
ST. LOUIS, MO.

NEW YORK, N. Y., No. 2 Rector Street

SAN FRANCISCO, CAL., Rialto Building

Experience

The original, therefore the oldest Diesel manufacturer in the United States, engaged in designing and building Diesel engines; with adequate technical staff and specially equipped Diesel works; guided in design, selection of materials, and workmanship by over thirty years of its own experience in building Diesel engines, both four and two-cycle types, heavy duty slow speed, special light weight high speed including stationary and marine reversing Diesels; under the direction of Dr. Diesel until 1913; by 15 years (1911-1926) of technical collaboration with the Swiss firm, Sulzer Brothers; and, at present, by the engineering research and technical advice of Allgemeine Elektrizitäts Gesellschaft of Germany, builders of the first successful solid injection double-acting two-cycle Diesel.

Stationary Engines

Four-cycle, trunk piston, slow, medium and high speed, sizes up to 1100 b.hp.

Two-cycle, trunk piston, slow, medium and high speed, sizes up to 7500 b.hp.

Two-cycle, single acting, crosshead, slow speed, sizes 600 to 7000 b.hp.



Two-cycle, double acting, sizes up to 15,000 b.hp.

Marine Engines

Two-cycle, double acting, direct drive, sizes up to 15,000 s.hp.

Two-cycle, single acting, slow speed, direct drive, sizes up to 7000 s.hp.

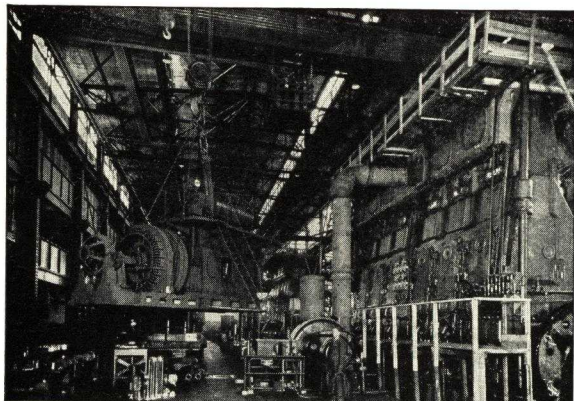
Two-cycle, medium speed, direct and electric drive, sizes 500 to 7000 b.hp.

Four-cycle, direct and electric drive, sizes up to 1100 b.hp.

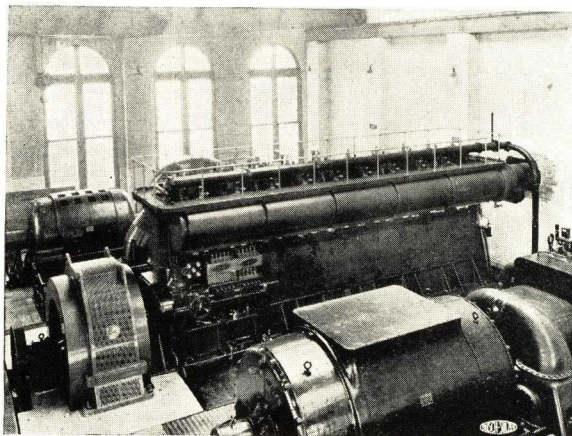
Two-cycle, high speed, sizes up to 6000 b.hp.
Special types to meet particular requirements.

Other Products

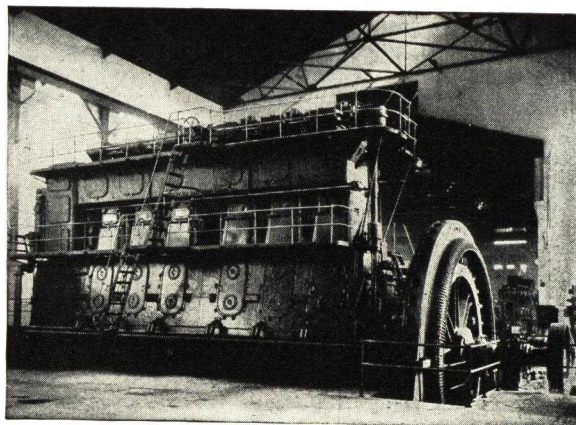
Hydraulic presses for special purposes.
Duo-presses for thermo-plastic moulding.
High pressure air compressors.
Special compressors.
Special high test gray iron castings.
Cast iron high temperature melting pots.
Special heavy machinery.



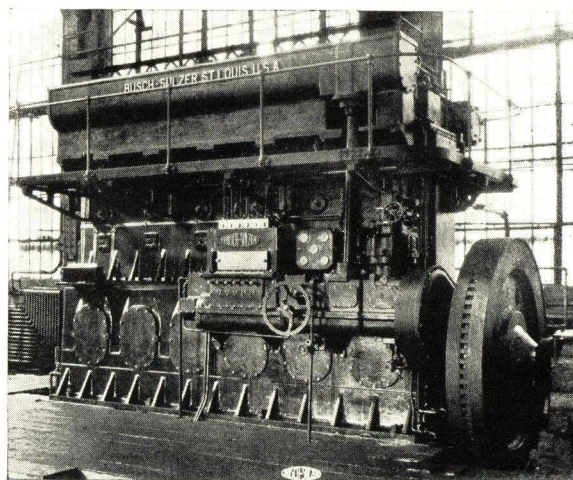
225 B.Hp. Four-cycle in Crane
Two 4000 B.Hp. Two-cycle Marine Diesels on Test Floor



3000 B.Hp. Trunk Piston Diesel Installed Between Two Turbines



3900 B.Hp. Type C with 2700 Kw. Flywheel Generator



Six Cylinder, Four Cycle, 780 B.Hp. on Test at Works

FAIRBANKS, MORSE & CO.

Manufacturers of Engines, Electrical Machinery, Pumps and Scales

GENERAL OFFICES

900 So. Wabash Avenue, CHICAGO, ILL.

ATLANTA, GA.
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DES MOINES, IOWA

DETROIT, MICH.
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BRANCHES THROUGHOUT THE WORLD

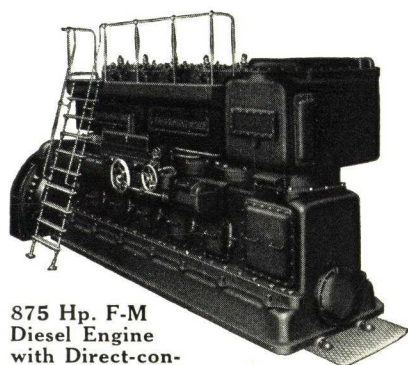
LOUISVILLE, KY.
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OMAHA, NEB.
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SEATTLE, WASH.
STUTTGART, ARK.

Products and Service

FAIRBANKS, MORSE & Co. manufactures COMPLETE EQUIPMENT for the GENERATION of ELECTRIC POWER, ELECTRIC MOTORS for driving various industrial machines, PUMPS to meet all pumping requirements, and SCALES of all types.



875 Hp. F-M
Diesel Engine
with Direct-con-
nected Alternator
and Exciter

Diesel Engines

For more than 40 years, Fairbanks-Morse has designed and built internal combustion engines. Over 4,000,000 hp. have been produced, about 2,000,000 hp. of which are F-M two-cycle oil engines.

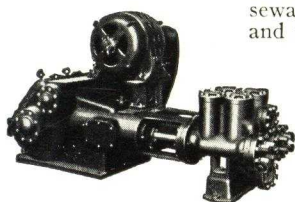
Diesel engines will reduce your power costs to a minimum. The over-all economy of these engines resulting from the efficient burning of low-grade fuel and from extreme simplicity in

construction and operation has, in most instances, paid for the original investment in a few years.

Fairbanks-Morse Diesel power units are available for direct connection to loads or with built-in generators. Sizes 8 to 3300 hp.

Pumping Equipment

FAIRBANKS, MORSE & Co. manufactures a complete line of centrifugal, steam, and power pumps for all classes of service, including ball bearing, single stage and multistage pumps, and enclosed reciprocating pumps, stock, sewage and trash pumps, screw pumps and turbine pumps.



Enclosed End Self-oiling
Duplex Power Pump

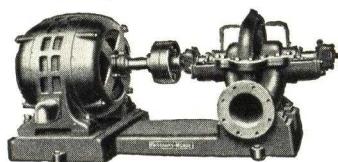


Fig. 5860. Ball Bearing Single
Stage Centrifugal Pump

PRINCIPAL TYPES OF CENTRIFUGAL PUMPS

Fig. Nos.	Sizes, in.	Capacities, g.p.m.	Max. heads, ft.	Suction	Impeller	Bearings	Casing
		Min.—Max.					
5510	1—8	20—2,200	100	Side	Open	Sleeve	Solid
5520	1—8	20—2,300	100	Side	Closed	Ball	Solid
5530	1—4	20—1,000	125	Side	Closed	Ball	Solid
5560	8—18	900—10,000	100	Side	Closed	Sleeve	Solid
5810	2—8	250—3,000	280	Double	Closed	Ball	Split
5840	12—42	3,500—65,000	200	Double	Closed	Sleeve	Split
5850	3—12	100—5,500	170	Double	Closed	Ball	Split
5860	2—10	50—4,000	300	Double	Closed	Ball	Split
5870	1½—8	90—2,800	300	Double	Closed	Ball	Split
5950	2—6	100—1,500	500	Side	Closed	Sleeve	Split

Trash Pumps

Fig. Nos.	Sizes, in.	Capacities, g.p.m.	Max. heads, ft.	Suction	Impeller	Bearings	Casing
5110	2—20	80—28,000	100	Bottom	Closed	Ball	Vertical
5120	2—20	80—28,000	100	Bottom	Closed	Ball	Horiz.

Turbine Pumps

Fig. Nos.	Sizes, in.	Capacities, g.p.m.	Max. heads, ft.	Suction	Impeller	Bearings	Casing
5900	4—16	50—2,200	300	Bottom	Closed	Sleeve	.....

Weighing Equipment

Fairbanks Scales have been manufactured for more than 100 years, during which time dependable weighing equipment for every industrial need has been developed. Highly efficient direct-reading dial scales are available for securing accurate production records at small expense. Many special types of scales have been developed, including mechanical recording, car charging, tippie and hopper scales, overhead track and overhead suspension scales, crane scales, etc.

For weighing in larger quantities, Fairbanks railroad track scales, auto truck and wagon scales give the same order of efficient service and sustained accuracy with negligible upkeep cost. Accurate control of every production step can be maintained. They are available in a range of sizes and capacities to meet all needs.



Self-con-
tained
Dial
Scale

Electrical Equipment

A complete line of general purpose and special motors for application to all kinds of machinery. Ball bearing motors—pioneered and developed by Fairbanks-Morse—are especially advantageous for all difficult drives where dependability is essential, such as driving ventilating fans, pit and mine pumps, air compressors, conveying equipment, etc. Bearings are sealed; they require lubrication only once a year.



Type QC Enclosed Fan
Cooled Motor

PRINCIPAL TYPES OF FAIRBANKS-MORSE MOTORS

Horsepower range	Synchronous speeds, r.p.m.	Frequencies	Standard voltages
Type Q Squirrel Cage Induction Motors with Sealed Ball Bearings, Normal Torque, Normal Starting Current, Constant Speed			
½—75	900, 1200, 1800	60	220, 440, 550, 2200
Type QS Line Start Squirrel Cage Induction Motors with Sealed Ball Bearings, Normal Torque, Low Starting Current, Constant Speed			
½—30	900, 1200, 1800	60	220, 440, 550, 2200
Type QC Enclosed Fan Cooled Squirrel Cage Induction Motors with Sealed Ball Bearings, Normal Torque, Normal Starting Current, Constant Speed			
½—75	900, 1200, 1800	60	220, 440, 550, 2200
Type H Ball Bearing Squirrel Cage Induction Motors, Normal Torque, Normal Starting Current, Constant Speed			
½—1200	400, 450, 500, 514, 600, 720, 750, 900, 1200, 1500, 1800, 3600	25 or 60	110, 220, 440, 550, 2200
Type B Sleeve Bearing Squirrel Cage Induction Motors, Normal Torque, Normal Starting Current, Constant Speed			
½—1200	400, 450, 500, 514, 600, 720, 750, 900, 1200, 1500, 1800	60	110, 220, 440, 550, 2200
Type HV Ball Bearing Wound Rotor Induction Motor, High Torque, Low Starting Current, Variable Speed			
¾—1000	400, 450, 514, 600, 720, 750, 900, 1200, 1800	25 or 60	110, 220, 440, 550, 2200
Synchronous Motors, Ball or Spherical Bearings			
20—10,000	450, 500, 514, 600, 720, 750, 900, 1200, 1500, 1800	25 or 60	220, 440, 550, 2200

DE LAVAL STEAM TURBINE CO.

TRENTON, N. J.

ATLANTA.
BOSTON
CHARLOTTE
CHICAGO

CLEVELAND
DENVER
DULUTH
EDMONTON, ALTA.

HAVANA
HELENA
HONOLULU
HOUSTON

SALES OFFICES
KANSAS CITY
LOS ANGELES
MANILA
MONTREAL

NEW ORLEANS
NEW YORK
PHILADELPHIA
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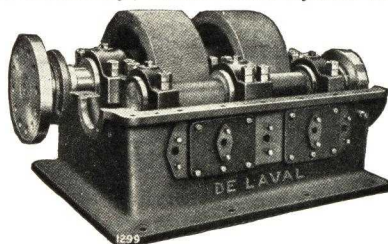
Products

Steam Turbines; Helical Speed Reducing Gears; Water Turbines; Centrifugal Pumps; Rotary Displacement Pumps; Propeller Pumps; Centrifugal Blowers and Compressors; Worm Reduction Gears; Flexible Couplings.

Also Special Centrifugal Machinery; Bauer-Wach System of Exhaust Turbines.

Steam Turbines

De Laval turbines are built for all steam conditions, including high pressure, condensing and non-condensing, back pressure, bleeder and mixed flow service. They are also adapted to driving machines at all speeds, either directly connected or through De Laval double helical speed reducing gears.



Double Helical Speed Reducing Gear

De Laval Velocity Stage Turbines

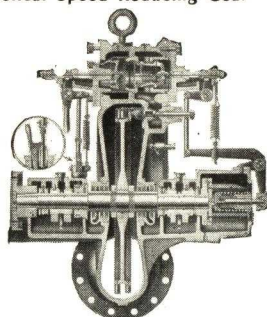
Designed to operate on high pressure, high temperature steam. All sizes up to 1200 hp.

De Laval Pressure Stage Turbines

Built in capacities up to 15,000 hp.

Water Turbines

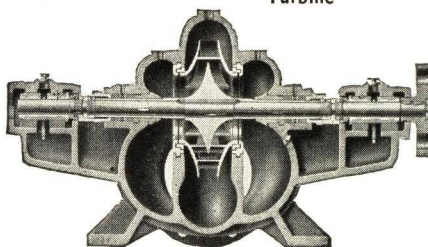
Small and medium capacities for direct connection to auxiliaries in water works pumping stations.



De Laval Velocity Stage Turbine

Centrifugal Pumps

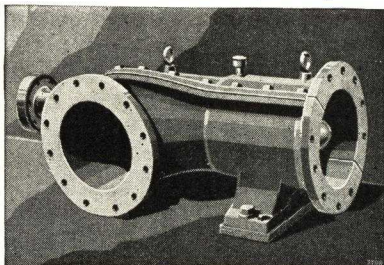
De Laval centrifugal pumps are characterized by conservative speeds, high class materials, construction on a limit gage interchangeable basis, guaranteed efficiency and capacity, and a comprehensive system of testing. The De Laval labyrinth wearing rings do not require small clearance in order to prevent excessive leakage and their life is much longer than that of flat rings. All parts subject to wear are easily accessible and renewable without disturbing piping.



Double Suction Single Stage Pump

Propeller Pumps

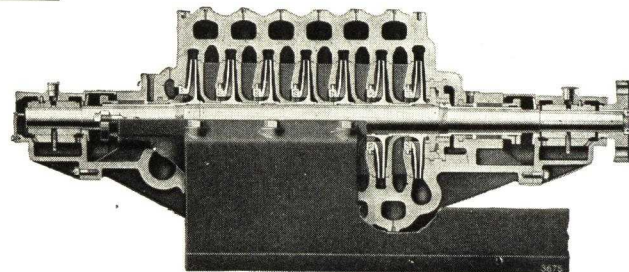
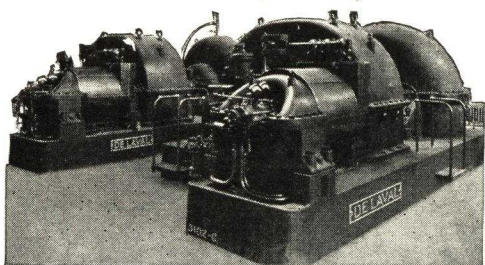
For handling relatively large volumes against comparatively low heads at turbine and motor speeds.



Propeller Pump

Geared Steam Turbines Driving Centrifugal Pumps

Each 60,000,000 gal. per day, 360-ft. head



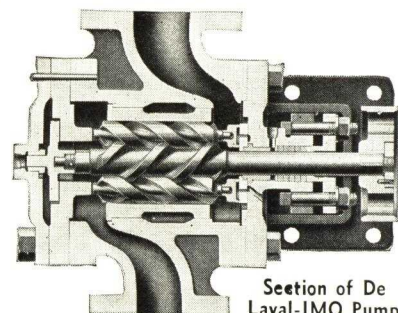
Single Suction Solid Diaphragm Pump for Very High Pressures

Centrifugal Blowers and Compressors

Built for all pressures up to 100 lbs. per sq. in.

De Laval-IMO Pumps

Rotary positive displacement pumps running at electric motor and steam turbine speeds, for pressures up to and exceeding 500 lb. per sq. in.



Section of De Laval-IMO Pump

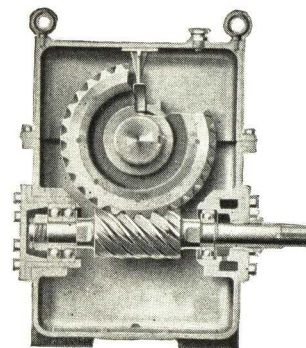
Flexible Couplings

De Laval pin and rubber bushing flexible couplings, used in connection with high speed and moderate speed machinery, are manufactured on an interchangeable basis by modern limit-gage methods.

De Laval Worm Reduction Gear

A superior, modern speed reducer for use with electric motors or steam turbines driving slow or moderate speed machinery. It is efficient, compact, silent, entirely self-enclosed, self-lubricating and immune to dirt and grit. It differs from ordinary worm gearing in the correct tooth shape, the high class materials used, the heat treatment of the materials and the manufacturing methods and shop control.

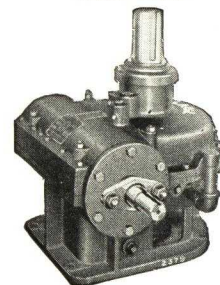
The De Laval worm reduction gear is built with the driving worm either at the top or at the bottom, and with the driven machine either at the right or the left. Vertical shaft drives are also supplied, with the shaft extending above or below. Single reductions are built for ratios up to 100 to 1, while the double reductions provide for ratios up to 8000 to 1.



Section of Bottom Drive Gear Taken Through Axis of Worm Shaft



Worm Reduction Gear for Top Drive



Worm Reduction Gear for Vertical Shaft Drive

Vertical drive frames are also made with the wheel shaft brought out at bottom

Guarantees

The performance of every De Laval machine is guaranteed, both as to capacity and efficiency, and a complete test is carried out before shipment. All De Laval apparatus is built on a limit-gage, interchangeable basis.

MOORE STEAM TURBINE CORPORATION

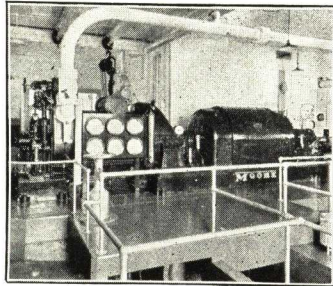
Manufacturers of Steam Turbines, Reduction Gears, Centrifugal Pumps

MAIN OFFICE AND WORKS
WELLSVILLE, N. Y.

OFFICES IN ALL PRINCIPAL CITIES

Turbo Generator Units

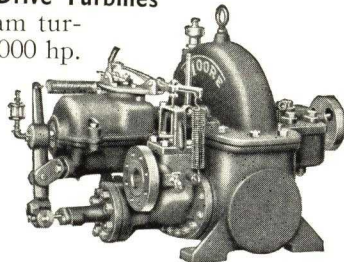
Moore turbo generator units are built in sizes ranging from 3 to 1500 kw. to operate under all steam conditions. All types are available, such as straight condensing, straight non-condensing, bleeder, mixed pressure bleeder, mixed pressure, low pressure and high back pressure. *Each unit is especially designed to best suit the conditions under which it will operate.* Either direct connected or geared units can be supplied.



1500 Kw. Turbo Alternator Unit

Auxiliary Drive Turbines

Moore single stage steam turbines built in sizes up to 1000 hp. are especially adapted for driving boiler feed pumps, forced and induced draft fans, circulating pumps, coal pulverizers and all auxiliaries where simplicity of construction and reliability are of prime importance.

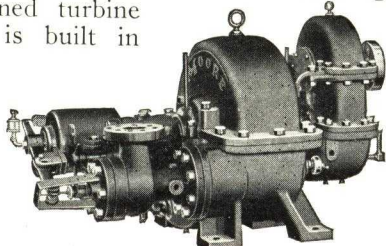


Moore Type U2RA Single Stage Steam Turbine

When maximum economy and long blade life are desired, Moore multistage steam turbines are used. They are built in sizes from 25 to 2000 hp. for either non-condensing or condensing operation.

Variable speed hydraulic governors are available for all Moore steam turbines when preferred to constant speed governors. This governor can be set for any desired speed over a broad range while the turbine is running.

The Moore combined turbine and reduction gear is built in sizes from 5 to 100 hp. and is especially adapted for auxiliary drive where low steam consumption is necessary in addition to reliability and simplicity of construction.



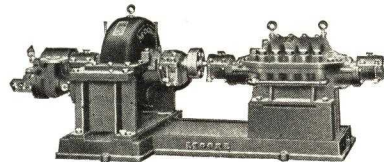
Moore Combined Turbine and Reduction Gear

MOORE

insures the entrance of water to the impeller with minimum shock loss. High efficiencies over an exceptionally wide range are permanently maintained. Pumps have horizontally split casings and bearings assuring easy inspection. All piping connections in lower half of casing. All parts of the pump are made to limit gauges insuring interchangeability. Built for motor, turbine or other drive.

We specialize in building of high duty turbine driven pumping units for waterworks and general use.

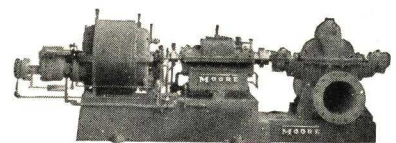
Boiler Feed Units—Moore multistage centrifugal pumps for boiler feeding and other high pressure work are offered with either turbine or motor drive. Complete turbine driven boiler feed units, including the pump



Moore Complete Boiler Feed Unit

governor, are available for all commercial steam conditions and boiler pressures.

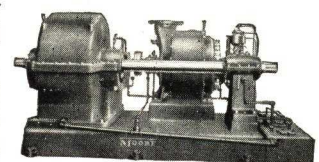
Units consisting of a Moore high efficiency pump driven by Moore multistage turbine are extensively used when high over-all efficiency is required.



Moore Turbo-gear Pumping Unit with Variable Speed Hydraulic Governor

Reducing and Increasing Gears

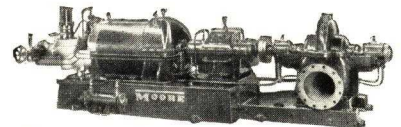
Moore double helical gears are designed with low tooth pressures, have no end thrust and are automatically lubricated both at the bearings and at the line of tooth contact. Each gear complete with oil pump, oil reservoir and oil cooler. Gear case and bearings are horizontally split. Gear and pinion are rigidly supported, insuring correct alignment at all times.



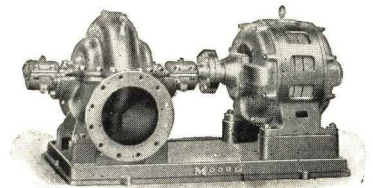
Moore Geared Paper Machine Drive Unit

Centrifugal Pumps

All single stage pumps are of the double suction type hydraulically balanced. *The guided inlet feature in-*



10 M.G.D. Turbine Driven Waterworks Pumping Unit



Low Head Motor Driven Unit

THE TERRY STEAM TURBINE CO.

HARTFORD, CONN.

DISTRICT OFFICES

ATLANTA, GA., 548 Hurt Building
 BOSTON, MASS., 10 High Street
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 DENVER, COLO., 1526 Blake Street
 DETROIT, MICH., 402 Donovan Building, 2457 Woodward Avenue
 GRAND RAPIDS, MICH., 637 Michigan Trust Building
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 MINNEAPOLIS, MINN., 732 Builders Exchange Building

MONTREAL, QUE., Fraser & Chalmers of Canada, Ltd., Canada Cement Building
 NEW HAVEN, CONN., 22 Fountain Street
 NEW ORLEANS, LA., 505 Queen & Crescent Building, 344 Camp Street
 NEW YORK, N. Y., 90 West Street
 PHILADELPHIA, PA., 1109 Otis Building, 16th and Sansom Streets
 PITTSBURGH, PA., 311 Ross Street
 PORTLAND, ORE., 224 Pine Street
 RICHMOND, VA., 301 American National Bank Building
 ST. LOUIS, MO., 5473 Delmar Boulevard
 SAN ANTONIO, TEX., A. M. Lockett & Co., Ltd., 1803 Smith Young Tower
 SAN FRANCISCO, CAL., Call Building
 SYRACUSE, N. Y., 716 Hills Building
 TORONTO, ONT., Storey Pump & Equipment Co., 58 Stewart Street
 TULSA, OKLA., Worthington Machinery Corp. of Oklahoma, 424 No Boulder Avenue
 WILKES-BARRE, PA., 1007 Coal Exchange Building
 MARINE DEPT.: 117 Liberty Street, NEW YORK, N. Y.

Products

STEAM TURBINES; HERRINGBONE GEARS; FLEXIBLE SHAFT COUPLINGS; TURBO-GENERATOR UNITS; PAPER MACHINE DRIVES; TURBO-GEAR UNITS.

Terry Steam Turbines

Each Terry Turbine is specially designed for the conditions under which it will operate. Therefore, in writing for information, the following data should be included so that we can offer the turbine best suited to your conditions: (1) Steam pressure available at the turbine inlet. (2) Temperature of steam. (3) Exhaust steam pressure. (4) Horsepower required. (5) Revolutions per minute at which driven machine will operate. (6) Make, size and type of machine which turbine will drive and any special details or requirements.

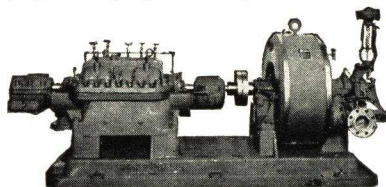
Applications—Terry Turbines are used to drive centrifugal pumps, blowers, fans, generators, exciters, coal pulverizers, paper machines, line shafting and many other types of apparatus. Vertical turbines are used to drive deep well pumps, blowers, etc.

Sizes and Types—All sizes up to 2000 hp. and for all steam pressures and exhaust pressures. Built for condensing, non-condensing, low pressure, mixed pressure and bleeder operation. Turbine may be either direct connected to driven machine or through Terry herringbone gears. Vertical turbines in capacities up to 600 hp. are also available.

Terry Multi-velocity Stage Turbines—Employ an indestructible one-piece wheel made from a solid forging. The buckets are milled from the solid metal. Blades have large clearances and are further protected by projecting rims at the sides of the wheel. It is impossible for the blades to foul. High efficiencies are obtained even at low speeds. Bulletin S-841.

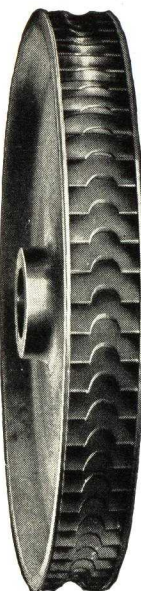
Terry Multi-pressure Stage Turbines—Employ a high pressure and low pressure element. High pressure element consists of a two or three-row velocity wheel; low pressure element consists of several stages of the Rateau type. Machines are so designed that the correct number of stages can be used to fit exactly the conditions under which turbine will operate. Bulletin S-801.

Governors and Control Mechanisms—Turbines may be equipped with various types of governors: (A) Constant speed, either direct acting or oil relay type. (B) Variable speed hydraulic fluid. (C) Overspeed trip. All Terry overspeed governors include entirely separate tripping mechanism and separate overspeed valve. They are in no way connected with main governor valve. (D) Pump governors, constant or excess pressure type. (E) Remote speed control mechanisms can be supplied so that turbine speed can be controlled from some distant point. (F) Governors to meet special requirements can also be designed. Tell us your problems and we will assist in their solution.



Boiler Feed Pump with Terry Turbine Drive

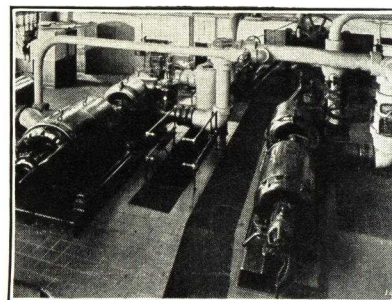
Turbine is equipped with excess pressure pump governor



One-piece Terry Turbine Wheel

Terry Turbo-generator Units

Made in all sizes from 3 to 1000 kw., d-c. or a-c. Used as main units in industrial plants. Small sizes employed for night lighting, week-end service, marine work, exciters, etc. Units may be designed for bleeder pressures or back pressures of 100 lb. or over. The steam may be used for process. Exhaust steam is free from oil and is suitable for all types of heating.



500 and 1000-kw. Terry Turbo-alternator Units Installed in Power Plant of a Paper Mill

Turbines furnish bled steam at 40 lb. pressure for process work

Small Terry Turbo-gear Units

Built in a large range of sizes suitable for driving pulverizers, pumps, blowers and the like. They permit both turbine and driven apparatus to operate at the most efficient speeds and are used where low steam consumption is required.

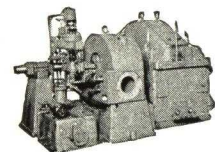


20-hp. Combined Turbo-gear Unit

Terry Paper Machine Drives

Consist of a specially designed turbo-gear set. Speed range can be any value up to 1 to 10. This permits a greater production and a greater variety of products.

Other advantages are: clean exhaust steam for drying, uniform speed, dependability, compactness, etc. Each drive is built to meet actual mill conditions. Bulletin S-891.



400-hp. Paper Machine Drive

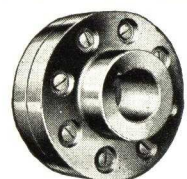
Terry Herringbone Gears

Used for speed increasing or reducing. All sizes up to 4000 hp.

Gears and pinions are double helical type. Forced feed lubrication. Oil pump below normal oil level insuring copious lubrication when starting. Bearings and gear housing are of extremely rugged construction. Cool, quiet, efficient. Specially designed for high speed service. Bulletin S-171.

Terry Flexible Coupling

High grade, accurately constructed coupling of pin and bushing type. Faces and peripheries of coupling flanges are accurately ground to facilitate checking alignment. Flanges are made from steel forgings. Sizes from 1 to 12-in. maximum shaft bore. When making inquiries, state diameter of shaft, revolutions per minute, horsepower transmitted and type of machines to be connected. Bulletin S-661.



ALEMITE INDUSTRIAL

LUBRICATION

Equipment
AND
Lubricants

ALEMITE CORPORATION

CHICAGO ILLINOIS

ALEMITE LUBRICATION is . . .

STANDARD EQUIPMENT IN THE PRODUCT OF OVER 750 MANUFACTURERS

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MORE than 750 manufacturers in all lines of industry now use Alemite Lubrication as standard equipment on the machines they make.

Wherever there is a moving part or bearing there is danger of the two metal surfaces coming in contact. Wherever there is metal-to-metal contact there is friction which steals away the power and vitality of a machine.

The fight against friction has been one of Industry's most perplexing problems. Gruelling wear at the vital bearings of a machine invariably leads to interrupted production for the repair and replacement of costly parts. Proper lubrication is the one thing that will check the ravages of friction, yet millions of dollars worth of industrial machinery is scrapped every year because lubrication has been neglected, or because the means of lubricating are inadequate.

There is a sure method of protection against nearly three-fourths of all frictional losses. It is the ALEMITE HIGH PRESSURE LUBRICATING SYSTEM.

In mines, quarries, factories, foundries, bakeries, laundries, print shops and saw mills ALEMITE LUBRICATION is reducing the cost of operating machinery. It is being successfully applied to line shafts, bridge gears, and industrial machines. It is giving greater speed, endurance and dependability to all kinds of productive equipment.

ALEMITE LUBRICATION is positive; it is cheaper and safer to apply, and the ease with which it may be performed encourages systematic and methodical use.

ALEMITE LUBRICATION will reduce the cost of operation and increase production profits in every line of industry.

ALEMITE CORPORATION

1826 Diversey Parkway, CHICAGO, ILL.

See back cover for Alemite Distributors

ADVANTAGES OF HIGH PRESSURE LUBRICATION

WHY POSITIVE LUBRICATION?

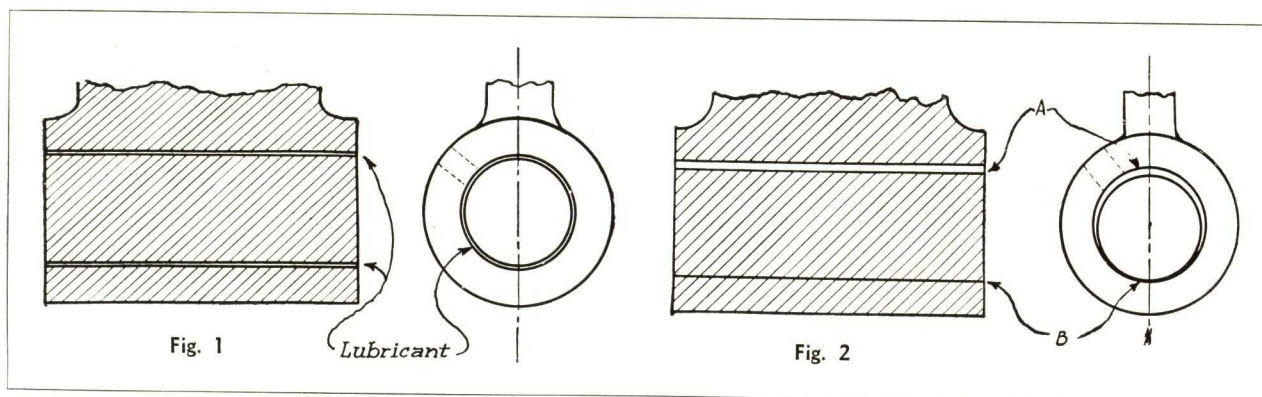
It isn't hard to understand why American industries scrap six billion dollars worth of machinery and parts every year, when we stop to consider the abuse they are subjected to. For under the heading "abuse" we must consider the item "negligence in lubrication." Every time a machine bearing is forgotten or overlooked by the oiler or greaser, the machine is punished.

But it is not always the fault of the man who lubricates your machinery. If your machine bearings are equipped with grease cups or oil holes, they may receive the best of attention—yet at the same time, are not positively lubricated.

Theoretically, the properly lubricated shaft floats completely on a film of lubricant. If that bearing is on a line shaft, theoretically it should operate as in Fig. 1

below. But more often Fig. 2 is a likely illustration. The shaft does not turn evenly in the bearing—a small amount of lubricant at point "A" does little or no good—friction and heat develop at "B" and sooner or later the expense of bearing replacement is unavoidable.

Such is quite often the case where a grease cup or oil hole is the only means of lubrication. The maximum pressure developed by the most efficient grease cup is about 40 pounds—a pressure wholly insufficient to force lubricant to all parts of the bearings, and a tedious time-wasting process. Only from 2% to 4% of the oil squirted into a bearing through an oil hole actually serves as a lubricant for the bearing. It drips away, effecting much more damage than lubrication.



HIGH PRESSURE METHODS

The principle of high pressure lubrication is this—a solidified oil may be used, a lubricant which does not drip away but clings to bearing surfaces to serve as a proper lubricant until it is entirely "spent." Such a lubricant, when applied under a pressure of from 2,000 to 5,000 pounds, is forced to the most remote parts of a bearing—yet when such lubrication is in use, all grit and worn out grease are forced out of the bearing. No dust or dirt, that has found its way into the bearing, can remain to scratch and mar its polished surfaces.

And with the proper Alemite fitting installed, the bearing is practically sealed, in-

sured against abuse. The hazard which is ever present when the human element is involved, is practically eliminated. There is no possibility of neglect, for bearings are easy to lubricate. Regardless of the location of a bearing, its lubrication may be conducted properly from a safe, convenient point.

These features of Positive Lubrication assure the plant owner or operator, that he is following an efficient plan for keeping his machinery in good condition.

These features alone can save him thousands of dollars each year, if he will but place this item of maintenance on a systematic basis.

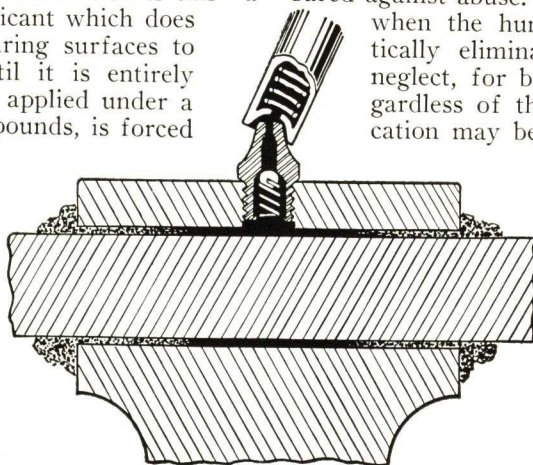


Fig. 3

ALEMITE IS HIGH PRESSURE LUBRICATION

THE ALEMITE BARREL-TO-BEARING SYSTEM — — GENERAL

FROM BARREL TO BEARING WITHOUT EXPOSURE

HERE is a method by which bearings on your machinery may be lubricated with lubricant which has never had an opportunity of being contaminated with dirt, cinders or other foreign matter. For by means of the Alemite Barrel-to-Bearing system, this lubricant is forced from its original shipping barrel, to your machine bearings without ever being exposed to air.

What tremendous advantages such a system offers!

First of all, it means that the old time method of squirting oil at an oil hole, or filling grease cups with a paddle, may be abandoned—a slow, tedious process

eliminated. It means that where you probably use both oil and grease for lubrication, you can now standardize on one lubricant—Alemite solidified oil. It means that every ounce of lubricant can be measured so that actual lubrication costs may be kept. Your oil storage room will be spotlessly clean—free from grease droppings and oil-soaked floors which constitute a plant's chief fire hazard. Lubrication can be completed in less than half the time required by ordinary methods, in an easy, systematic manner. No lubricant can be wasted, for it is always handled by efficient equipment, under pressure.



HERE'S THE SYSTEM!

The drawing at the left clearly illustrates the Alemite Barrel-to-Bearing system. You will notice that the Alemite Lubricant shipping drum has been specially prepared for the insertion of a barrel pump through a 2-in. bung. No prying or cutting of the drum head is necessary. Merely replace the screw cap with the pump. In order that the 400 pounds of lubricant can be easily moved about the store room, a special dolly may also be procured. This pump delivers exactly one pound of lubricant per stroke—a feature which offers the storekeeper an opportunity for an accurate check on the quantity of lubricant used, or in storage at any time.

This pump is equipped with a six-foot hose at the end of which is mounted a patented drip-proof nozzle, which eliminates the possibility of waste.

This barrel pump is used to fill the second piece of equipment used in "Barrel-to-Bearing" lubrication, the Model 1010 Filler Tank, shown also at the left. This Filler Tank is designed for an intermediate supply of 21 pounds of lubricant; it is portable and is carried about the shop or plant in order that the man in charge of lubrication will not have to return repeatedly to the stock room for lubricant (Fig. 5). The nozzle of the barrel pump is inserted in the Filler Tank opening—twenty-one strokes of the pump crank and the Filler Tank is full. (Fig. 4.)

The Filler Tank is an automatic device for loading the Alemite Push-type Compressor, Model 3-G, which hangs on a bracket at its side. The 3-G gun is designed with a hollow handle, closed by a screw cap. When this cap is removed the pistol grip handle slips snugly over exposed nozzle of the Filler Tank. One turn of the Tank crank and nine ounces of lubricant are shot into the gun, completely filling it. (Fig. 6, page 3.)

From this point on, lubrication is very simple. With each bearing equipped with either a threaded or a drive-fitting (see page 6), lubrication is performed merely by contact with the compressor. Its concave nozzle is placed over the cone-shaped fitting—and with slight pressure, lubricant is shot into the bearing under thousands of pounds pressure. (Fig. 7, page 3.) By repeated strokes, fresh clean lubricant is forced to all parts of the bearing, pushing out grit and old grease which has served its purpose.

Alemite lubricant contains no fillers which remain in bearings to clog and bind them—it is a positive friction remover, and contains no ingredients which are incorporated for purposes other than lubrication. It is solidified by a cooking process which combines the oils and animal fats in such a manner that they will not separate or break down under the high pressures. Temperatures of 200° will in no way affect its lubricating qualities. It is the lubricant compounded especially for use with Alemite high-pressure systems, and its use will not only insure proper bearing operation but will eliminate all possibilities of trouble with this type of lubrication. (See page 13.)



Fig. 5

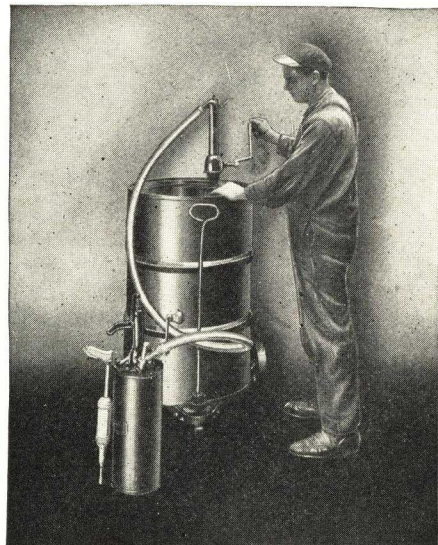


Fig. 4

ALEMITE LUBRICATION REACHES ALL BEARING SURFACES

BARREL-TO-BEARING SYSTEM—THE ALEMITE HEADER BLOCK

THE SYSTEM—CONTINUED



Fig. 6

Compare this systematic lubrication plan with the methods in use in your plant at present. How many men are performing this most important duty in your shop? And how long does it take them? Repeatedly, users of this system have shown us where the actual saving in time and labor for one year will net a 200% return on the investment in equipment and lubricants.

And think of the intangible items which are directly affected by the installation and use of these modern methods. How many dollars of your overhead expense could be saved if your fire insurance rates were reduced; if 80% of your machine breakdowns could be eliminated; if two-thirds of your present spoilage due to dripping oil could be prevented; if your power consumption could be reduced 10% through smoother operation of line shafts, speed reducers, conveyors, and machinery in general?

Barrel-to-Bearing Lubrication will accomplish this for you—in just the same manner that it is working for over 12,000 plants today.

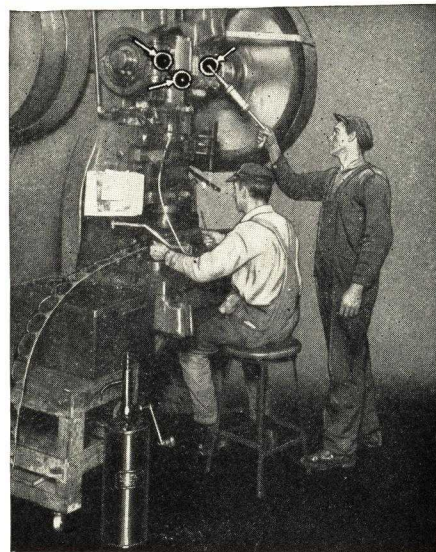


Fig. 7

LUBRICATION FROM A CENTRAL POINT

HAPHAZARD systems of lubrication are largely responsible for many costly and dangerous plant operating practices. Shutting down the machinery for lubrication is costly and where men must wait until closing time or the noon hour to lubricate machines hard to reach while running, you are obliged to gamble that

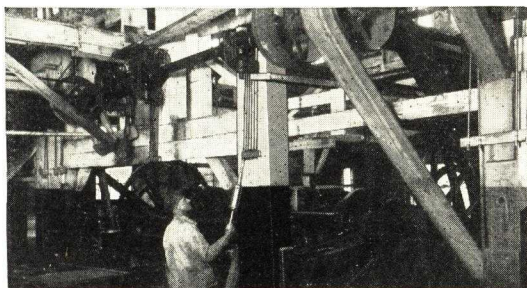


Fig. 8

in the meantime, the bearings will not need a wear-protecting film of lubricant.

Where the machinery is not shut down the workmen must often reach or climb about the machines to get to the lubrication points—a practice responsible for a very large percentage of the total industrial accidents today.

The Alemite Header Block

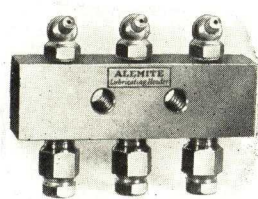
The most economical and safe method of lubricating those bearings is by use of Alemite Header Blocks which contain either 3 or 6 Alemite Push-type fittings and corresponding tube couplings. They are drilled and tapped for mounting either directly on a machine or a column in the building (Fig. 8). Lubricant is conducted from Header Blocks to bearings by $\frac{1}{8}$ in. copper tubing, and with proper connection made at bearing, lubrication is a simple process. For lubricating more than 6 bearings from one point, additional Header Blocks are added.

No noticeable loss in pressure occurs, even where 100 ft. of tubing is used between Header Block

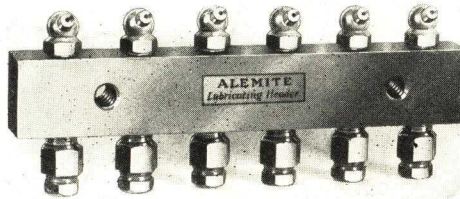
and bearing. The Alemite Push-type Gun (see page 5) supplies 5,000 lbs. pressure—an assurance that lubricant reaches its destination—and in measured quantities, permitting operator to know how much lubricant reaches each bearing, including those out-of-sight.

Compare this simple method, as it applies to line shaft bearings, with your present method of “ladder” lubrication. With the use of Header Blocks with the Barrel-to-Bearing system, ladder carrying is eliminated, three-fourths of the time and much of the lubricant is saved, the personal hazard is

minimized and all interruptions due to shutting down for lubrication are eliminated.



5024—3-stage



5025—6-stage

ALEMITE HEADER BLOCKS

PIPED LUBRICATION THROUGHOUT PROTECTS THE PLANT

BARREL-TO-BEARING SYSTEM—THE ALEMITE DRIVE FITTING

PERMITS ANY BEARING TO BE ALEMITE EQUIPPED IN 3 MINUTES

Fig. 11

It is easy to determine which adapter should be used, with the aid of the special adapter gauge. Remember—use the size larger than the largest adapter which may be inserted.

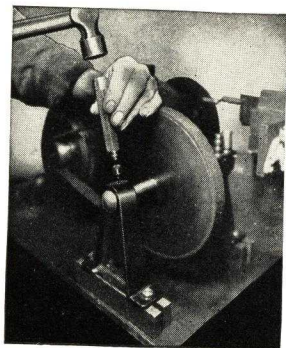
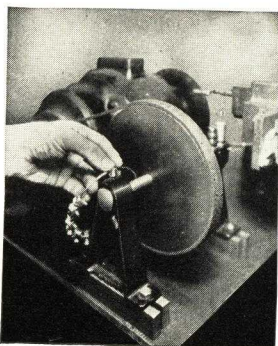


Fig. 12

Insert the adapter drive tool in the adapter head, and drive it into place. The accurately machined shank will grip the oil hole permanently.

Fig. 13

Next use the special fitting drive tools—one for straight fitting—one for angle—and drive the fitting into the adapter. It will fit accurately and firmly.

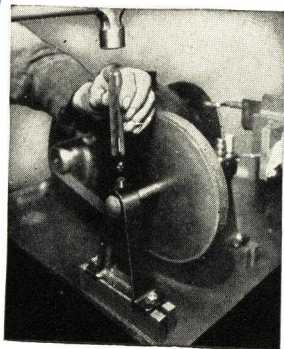
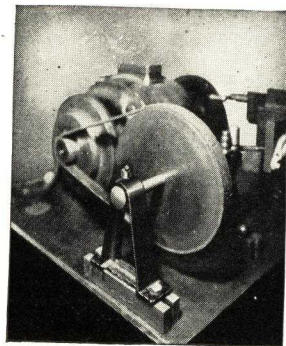


Fig. 14

Compare this bearing, equipped for systematic lubrication, with those in your plant which are constantly covered with oil and dust.



THE historic chariots of old Rome are just as out-of-date today as the oil holes the old warriors drilled in their crude bearings to provide for the lubrication of their chariot wheels—nevertheless machine bearings are still equipped for such crude lubrication. And when one stops to consider how inefficient such methods are the essential need of a modern lubricating system becomes more and more apparent.

Investigations show that of the oil purchased for industrial use in lubrication through oil holes, only about 2 to 4% actually is efficient. There is a tremendous waste in oil storage rooms—oil cans are filled till they overflow. Much oil is wasted by inefficient labor—it is common practice to squirt the can two or three times to see if it is working properly. Next the oil can spout is pointed "toward" the oil hole, and the can again goes into action. Oil runs out at bearing ends or it backs up in the none too clean oil hole and floods the outside of the bearing, dripping off on the floor or machine. All grit that has found its way through the open oil holes remains in the bearing to scratch and mar its surfaces.

The Alemite Drive Fitting

Alemite Drive Fittings provide a simple means of closing these oil holes and lubricating all bearings by one method. The Alemite Drive Fitting consists of an adapter and a fitting containing a ball check valve. In closing an oil hole, the proper size adapter is first determined by means of the ring gauge shown on page 5, on which all sizes of adapters are mounted—there are sixteen varying in size from $\frac{1}{8}$ to $\frac{1}{2}$ in. diameter.

The proper size and type adapter (see Fig. 10) having been selected and inserted, a special Alemite Push-type Fitting is next driven into the hole provided in the top. These fittings, listed on page 5, are all the same size, accurately machined to fit all adapters. The ball check valves, within the fittings, hold the lubricant in the bearing and prevent the entrance of foreign matter.

Figures 11 to 14 inclusive clearly illustrate the method of applying Alemite Drive Fittings to all types of oil holes. Any bearing may be equipped for Barrel-to-Bearing lubrication in three minutes—and these drive fittings permanently assure proper lubrication with no waste, no loss of time, no damaged materials or oil-soaked floors.

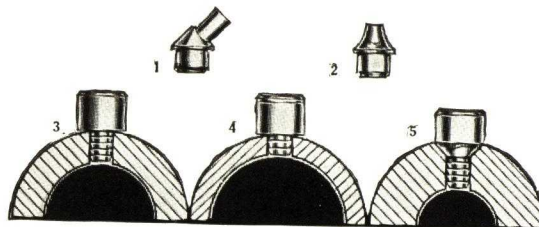


Fig. 10

Showing the three types of adapters: No. 3 standard, No. 4 short and No. 5 countersunk shank. Fittings include No. 2 straight nipple for vertical contact with compressor and No. 1, a $67\frac{1}{2}^\circ$ angle nipple for angular contact.

ALEMITE RENDERS THE OIL CAN OBSOLETE

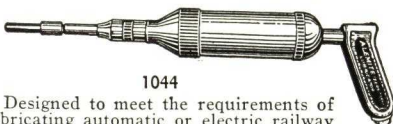
BARREL-TO-BEARING SYSTEM—EQUIPMENT



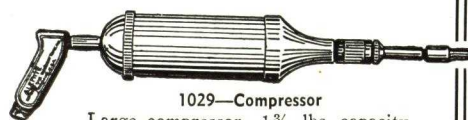
Z-3-A—Compressor
For semi-solid lubricant or oil. Capacity 9 oz.



Z-3-G
Handle fill type, for semi-solid lubricant or oil. Capacity 9 oz.



1044
Designed to meet the requirements of lubricating automatic or electric railway switch and signal systems. Capacity 9 oz.



1029—Compressor
Large compressor—1 3/4 lbs. capacity

PUSH-TYPE COMPRESSORS

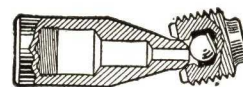
Standard Alemite 3-G Push-type Compressor delivers 1 oz. of lubricant in 50 strokes and the 1029 compressor delivers 1 oz. in 15 strokes. By placing a collar of any desired length just above the nozzle, the amount delivered per stroke may be reduced, as required. Lubricant delivered to bearing is accurately measured by the strokes of the compressor.

LOW PRESSURE NOZZLES

Any Alemite Push-type compressor may be transformed into a low pressure gun which empties its entire charge of 9 oz. in one rapid stroke, by substituting Low Pressure Nozzle Z-615-AA or Z-616-A.

FILLER TANKS

Intermediate supply tanks for use in Barrel-to-Bearing lubrication—filled through tap directly from Alemite Drum by the Alemite Barrel Pump—capac., 20 lbs.; weight, loaded, 35 lbs.



← Fitting

Flush Type Nozzle

Interchangeable on Z-3-A, Z-4-A, Z-3-G and Z-6-B compressors. Detail illustration showing lubricating contact of Z-737 nozzle and our flush type fitting



Z-615 AA Elbow



Z-616-A Straight

Low Pressure Nozzles

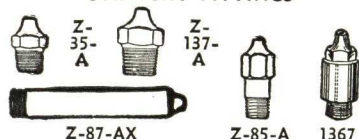
For quick filling of parts requiring large quantities of lubricant, such as gear cases, transformer housings, etc.



1010—Filler Tank

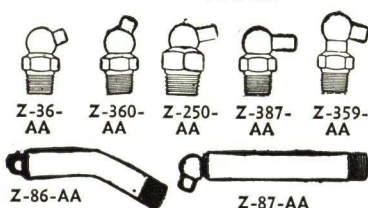
ALEMITE PUSH-TYPE FITTINGS

STRAIGHT FITTINGS



- 1/8" P. T. Fittings**
Z-35-A 1/8" P.T.S.F.
1212 1/8" P.T.S.F. Hardened Tip
1447 1/8" P.T.S.F. 3 1/2" long
Z-85-A 1/8" P.T.S.F. Long Body
Z-604-A 1/8" P.T.S.F. 2 3/4" long
1391 1/8" P.T.S.F. 2 3/4" long
Z-87-AX 1/8" P.T.S.F. 2 3/4" long
1333 1/8" P.T.S.F. 2 3/4" long, spec.
1367 1/8" Double Check
- 1/4" Pipe Thread Fitting**
Z-137-A 1/4" P.T.S.F.
- 3/8" Pipe Thread Fitting**
1249 3/8" P.T.S.F.
*S.F. Straight Fittings.
- Special Fittings**
1295 1/4" -32 M.T.S.F.
Z-694-A 1/4" -32 M.T.S.F.
1218 1/4" -32 M.T.S.F. No. B. & S.
Z-676-A 3/8" -24 M.T.S.F.
1392 1/2" -20 M.T. Extension Fitting
- Special Fittings, Various Angles**
1296 1/4" -32 M.T. 67 1/2° E.F.
Z-695-AA 1/4" -32 M.T. 67 1/2° E.F.
1381 1/4" -32 M.T. 90° E.F.
Z-677-AA 3/8" -24 M.T. 67 1/2° E.F.
1230 3/8" -32 M.T. 30° E.F.
1398 1/2" -20 M.T. 67 1/2° E.F.

ELBOW FITTINGS



- 1/8" P. T. Elbow Fittings 30° Angle**
Z-360-AA 1/8" P.T. 30° E.F. Regular
Z-133-AA 1/8" P.T. 30° E.F. Long Tip
Z-655-AA 1/8" P.T. 30° E.F. 2" long
Z-86-A 1/8" P.T. 30° E.F. 2 3/4" long
- 1/8" P. T. Elbow Fittings 45° Angle**
1250 1/8" P.T. 45° E.F. Regular
Z-673-AA 1/8" P.T. 45° E.F.
- 1/8" P. T. Elbow Fittings 67 1/2° Angle**
Z-36-AA 1/8" P.T. 67 1/2° E.F. Regular
1448 1/8" P.T. 67 1/2° Short Tip
Z-37-AA 1/8" P.T. 67 1/2° E.F. Long Body
Z-87-AA 1/8" P.T. 67 1/2° E.F. 2 1/8" long
Z-630-AA 1/8" P.T. 67 1/2° E.F. 3 3/4" long
- 1/8" P. T. Elbow Fittings 90° Angle**
1399 1/8" P.T. 90° E.F. Short Body
Z-387-AA 1/8" P.T. 90° E.F. Regular
1235 1/8" P.T. 90° E.F. 1 1/8" long
1435 1/8" P.T. 90° E.F. Lock Nut
- 1/8" P. T. Elbow Fittings 105° Angle**
Z-359-AA 1/8" P.T. 105° E.F.
- 1/4" P. T. Elbow Fittings**
Z-250-AA 1/4" P.T. 67 1/2° E.F. Regular

ALEMITE DRIVE FITTINGS

DRIVE FITTINGS

To be used with adapters below



DRIVE FITTING ADAPTERS

Gauge No.	No. of rings	Drive size, in.	Shouldered Short	Shouldered Long	Tapered Long
1	1	1/8	P-42501	P-42502	P-42503
2	2	3/16	P-42504	P-42505	P-42506
3	3	1/4	P-42507	P-42508	P-42509
4	4	5/16	P-42510	P-42511	P-42512
5	0	3/8	P-42513	P-42514	P-42515
6	1	7/16	P-42516	P-42517	P-42518
7	2	1/2	P-42519	P-42520	P-42521
8	3	5/8	P-42522	P-42523	P-42524
9	4	3/4	P-42525	P-42526	P-42527
10	0	7/8	P-42528	P-42529	P-42530
11	1	1	P-42531	P-42532	P-42533
12	2	1 1/8	P-42534	P-42535	P-42536
13	3	1 1/4	P-42537	P-42538	P-42539
14	4	1 3/8	P-42540	P-42541	P-42542
15	0	1 1/2	P-42543	P-42544	P-42545
16	1	1 5/8	P-42546	P-42547	P-42548

DRIVE TOOLS

5026—Adapter D. T.



5027—Straight Fitting D.T.

5028—Elbow Fitting D. T.



ALEMITE AUTOMATIC LUBRICATING CUP



A device for use with Push-type compressor and which provides a constant, regulated flow of lubricant to the bearings. Plain and adjustable type. The springs can be changed to a different tension to obtain a more or less rapid flow of lubrication.

Part No.	Description	Part No.	Description
G-43500	1/2 oz. Plain Automatic	G-43530	1 oz. Adjustable
G-43510	1 oz. Plain Automatic	G-43540	1 oz. Adjustable
G-43520	1 oz. Plain Automatic	G-43570	2 oz. Adjustable
G-43550	2 oz. Plain Automatic	G-43580	2 oz. Adjustable
G-43560	2 oz. Plain Automatic	G-43610	4 oz. Adjustable
		G-43620	4 oz. Adjustable

BUY GOOD EQUIPMENT AND ALEMITE IT FOR SAFETY

ALEMITE INDUSTRIAL LUBRICATION SYSTEMS

FLUSH TYPE SYSTEM



5069—Compressor
Same as Z-3-G, page 5, except that it is equipped with flush type nozzle



Showing Lubricating Contact of Z-737 Nozzle and Flush Type Fitting



Z-737

FLUSH TYPE NOZZLES

Z-737 Flush Type Nozzle. Interchangeable with regular nozzles on Z-3-A, Z-4-A, Z-3-G and Z-6-B Compressors.

P-41859 Flush Type Nozzle. Interchangeable with regular nozzles on Z-7-B, Z-7-C and Z-7-D Compressors.

P-41613 Flush Type Nozzle. Interchangeable with regular nozzle on 1029 Compressor.



Z-706-A



Z-730-A



Z-731-A



Z-741-A



Z-742-A



1452

FLUSH TYPE FITTINGS

Z-706-A	5/8"-18 M.T. Flush Type Fitting	1291	1/4" Pipe Thread Straight
1528	1/4" Drive Flush Type Fitting, oil tight	1297	3/8"-16 M.T. Straight
Z-730-A	5/16" Drive Flush Type Fitting	1365	1/8" P.T. 1/8" Hex. Flush Type Fitting
Z-731-A	3/8" Drive Flush Type Fitting	1452	1/8" P.T. Fitting
Z-741-A	1/4" P.T. Pipe Flush Type Fitting	1514	1/8" P.T. 2 3/16" Ext. Flush Type Fitting
Z-742-A	3/8" Pipe Flush Type Fitting		

GIANT FLUSH TYPE FITTINGS, NOZZLE AND CLEANER



1039—Mine Car Lubricating Gun



1334



1260

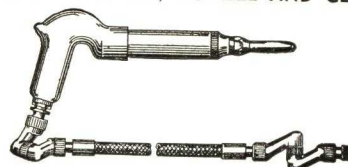


1258



1259

- 1260 5/8"-11 M.T. Giant Flush Type Fitting
- 1334 1/2"-12 M.T. Giant Flush Type Fitting
- 1338 3/8" Pipe Thread Giant Flush Type Fitting
- 1257 1/2" Pipe Thread Giant Flush Type Fitting
- 1258 3/4" Pipe Thread Giant Flush Type Fitting
- 1259 1" Pipe Thread Giant Flush Type Fitting



1139 Hose and 1039 Gun Assembly for Giant Flush Type Fittings—Hose, 5 ft. 6 in. Long



1144 Hose and 1039 Gun Assembly for Giant Flush Type Fittings—Hose, 10 ft. long

GIANT FLUSH TYPE FITTING CLEANER



No. 5010

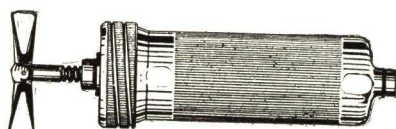
Slight pressure on handle causes cleaner to revolve—automatically cleans the fittings

BUTTON HEAD SYSTEM

The Alemite Button Head system was developed primarily for industrial purposes. This system can be used in connection with our Service Compressors (see page 11) very easily, simply by changing the couplings of the Hose.

Compressors

Any of the Alemite Compressors listed on Page 11 can be used with the Button Head system.



1080—Regular Large Size Compressor



1110—Heavy Duty Hose Equipped with Pull-on Coupling

The use of the Button Head Hose is not limited or restricted to the 1080 Compressor alone—but can be used with any Alemite Compressor wherever conditions or necessity demands.

FOR USE ON LINE SHAFTING, PULLEYS AND REVOLVING MACHINERY

ALEMITE INDUSTRIAL LUBRICATION SYSTEMS

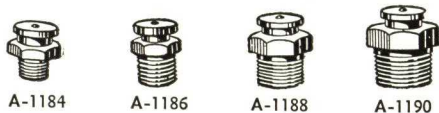
BUTTON HEAD SYSTEM—CONTINUED

BUTTON HEAD TYPE FITTINGS

Standard Button Head Alemite Fittings are particularly designed for industrial purposes. To be used in connection with Compressors on Page 6, Hose on Page 8 and Service Compressors with the Button Head Couplings.

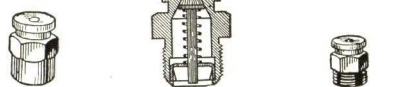
Limited number of illustrations shown—furnished in all standard sizes and threads.

STRAIGHT FITTINGS



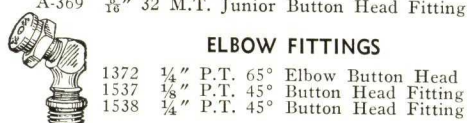
- Pipe Thread Fittings**
- A-1184 1/8" P.T. Button Head Fitting, long thread
 - 1246 1/8" P.T. Button Head Fitting, short thread
 - A-1186 1/4" P.T. Button Head Fitting
 - A-1188 3/8" P.T. Button Head Fitting
 - A-1190 1/2" P.T. Button Head Fitting

- Heavy Duty Heat Treated Fittings**
- 1401 1/4" P.T. Fitting for heavy lubricants
 - 1396 3/8" P.T. Fitting for heavy lubricants



- Female Fitting**
- C-69 1/8" P.T. Button Head Fitting (female)
- Waterpump Fitting**
- A-1106 3/8" W.P. Fitting
- Junior Button Head Fitting**
- A-369 1/8" 32 M.T. Junior Button Head Fitting

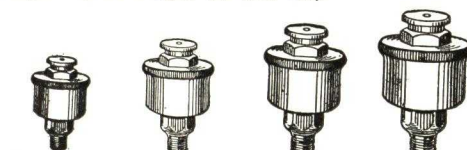
ELBOW FITTINGS



- 1372 1/4" P.T. 65° Elbow Button Head
- 1537 1/8" P.T. 45° Button Head Fitting
- 1538 1/4" P.T. 45° Button Head Fitting

PLAIN STEEL LUBRICANT CUPS

Plain Steel Lubricant Cups manufactured expressly to be used in connection with the Alemite Lubricating Systems—reinforced with Heavy Leather Washers thereby preventing leakage of lubricant through threads—designed to meet the necessities of bearings requiring large quantities of lubricant. These Cups can be equipped with our regular Pin Type Fittings. (See Pages 10 and 11.)



- RM-00—1" Alemite Cup
- RM-0—1 1/8" Alemite Cup
- RM-1—1 3/4" Alemite Cup
- RM-2—2" Alemite Cup

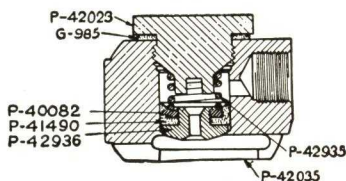
- | | | | |
|-------|------|------------------|--------|
| RM-00 | 1/8" | Pipe Thread Size | 1" |
| RM-0 | 1/8" | Pipe Thread Size | 1 1/8" |
| RM-1 | 1/4" | Pipe Thread Size | 1 3/4" |
| RM-2 | 1/4" | Pipe Thread Size | 2" |
| RM-22 | 3/8" | Pipe Thread Size | 2" |

COUPLINGS FOR THE BUTTON HEAD SYSTEM



G-42930—Pull On Type—Button Head Coupling—Metal Sealing Washer

G-42030—Pull On Type—No Sealing Washer



Detail Illustration—G-42930

G-42930 Repair Parts

- G-985 Gasket
- P-40082 Washer
- P-41490 Cup Leather
- P-42023 Plug
- P-42035 Body
- P-42935 Spring
- P-42936 Steel Plunger

G-42030 Repair Parts

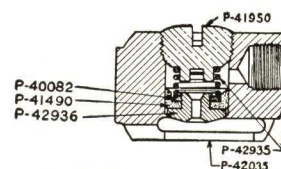
- G-985 Gasket
- G-41493 Plunger Assembly
- P-42023 Plug
- P-42035 Body



G-42932—Pull On Type—Special Button Head Coupling—Metal Sealing Washer

G-42052—Pull On Type—No Sealing Washer

G42452—Same as G-42052, But Is a Push On Coupling



Detail Illustration—G-42932

G-42932 Repair Parts

- P-40082 Washer
- P-41950 Plug
- P-41490 Cup Leather
- P-42035 Body
- P-42935 Spring
- P-42936 Steel Plunger

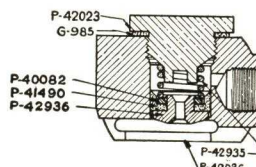
G-42052 Repair Parts

- G-41493 Plunger Assembly
- P-41950 Plug
- P-42035 Body



G42931—Push On Type—Button Head Coupling—Metal Sealing Washer

G-42031—Push On Type—No Sealing Washer



Detail Illustration—G-42931

G-42931 Repair Parts

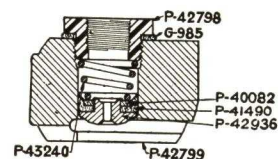
- G-985 Gasket
- P-40082 Washer
- P-41490 Cup Leather
- P-42023 Plug
- P-42036 Body
- P-42935 Spring
- P-42936 Steel Plunger

G-42031 Repair Parts

- G-985 Gasket
- G-41493 Plunger Assembly
- P-42023 Plug
- P-42036 Body



G-43135—Hook On Coupling—Metal Sealing Washer



Detail Illustration—G-43135

G-43135 Repair Parts

- | Part No. | Description |
|----------|---------------|
| G-985 | Copper Gasket |
| P-40082 | Washer |
| P-41490 | Cup Leather |
| P-42798 | Plug |
| P-42799 | Body |
| P-42936 | Steel Plunger |
| P-43240 | Spring |

REPAIR PARTS



- P-42023 Plug
- G-41493 Plunger Assembly
- P-41950 Plug
- G-985 Gasket



C-559—Adapter G-42166—Adapter

- Coupling Adapter**
- C-559 Adapter
 - P-42165 Adapter Body
 - G-42166 Adapter Complete

FOR USE ON LINE SHAFTING, PULLEYS AND REVOLVING MACHINERY

ALEMITE INDUSTRIAL LUBRICATION SYSTEMS

GIANT BUTTON HEAD SYSTEM

VOLUME COMPRESSOR



Part No. 1001

All Metal Compressor—particularly designed for volume lubrication—twenty-eight pounds capacity—500 pounds pressure easily developed—1½ ounces delivered with each stroke of handle—the best results obtained by use of heavy oil or semi-solid lubricant. Particularly designed for volume and track roll lubrication.

HEAVY DUTY BUTTON HEAD TYPE GIANT FITTINGS



Designed to be used in connection with heavy duty Button Head Type Hose.



1215	¾" P.T. Heavy Duty Button Head Fitting
1201	¾" P.T. Heavy Duty Button Head Fitting
1202	¾" P.T. Heavy Duty Button Head Fitting
1200	1" P.T. Heavy Duty Button Head Fitting
1203	¾" .11 M.T. Heavy Duty Button Head Fitting
1247	¾" .11 M.T. Heavy Duty Button Head Fitting
1364	¾" P.T. Heavy Duty Button Head Fitting
1383	¾" P.T. Heavy Duty Button Head Fitting
1457	¾" x18 Giant Button Head Fitting
1510	¾" P.T. Heavy Duty Fitting
1511	¾" P.T. Heavy Duty Fitting
1512	¾" x18 Heavy Duty Fitting

Hardened for track roll lubrication

HOSE FOR GIANT BUTTON HEAD FITTINGS



5405—3-Way Coupling—7 ft. long
5123—1-Way Coupling—5 ft. long



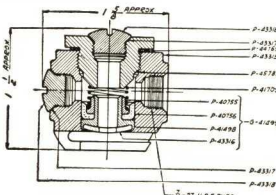
5078—24" Rubber Whip End Hose, Giant Button Head Coupling—⅛" Connection
For use with the Alemite Gat guns and also with larger service compressors

Part No.	Description
A-913	Sleeve (5124)
P-40901	Spring
P-40902	Retainer Washer
P-40903	Cup Leather
P-40904	Hose Ring
P-40905	¾" P.T. Hose Stud
P-40996	¾" P.T. x ¾" P.T. Bushing

HOSE REPAIR PARTS

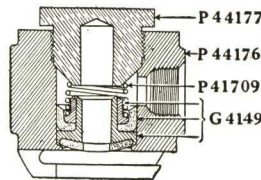
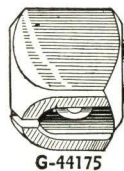
Part No.	Description
P-41697	⅞"-27 Male x ¾" P.T. Female Sleeve (5123)
P-41729	¾"x¾" Connection (5123)
P-42198	¼" Pipe Nipple (5124)
P-42802	¼" Coupling (5124)
P-44084	Hose Fitting
G-44085	Hose Ring, Stud and Fitting Assembly

Part No.	Description
P-44086	Sleeve Nut (5124)
G-44087	Sleeve Nut, Stud and Fitting Assembly (5124)
G-44175	Giant Pull-on Coupling (5123)
G-44376	Rubber Hose and Stud Assembly
P-44382	Extension Adapter (5123)



G-45778—3-way Coupling

COUPLINGS



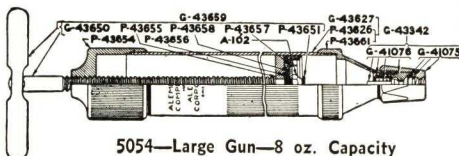
Repair Parts
G-41499 Plunger Assembly
P-41513 Retainer Screw
P-41709 Spring
P-43315 Coupling Body
P-43317 Plug Gasket
P-43318 Plug

Part No.	Description
G-41499	Diaphragm Assembly
P-41709	Spring
P-44176	Coupling Body
P-44177	Plug

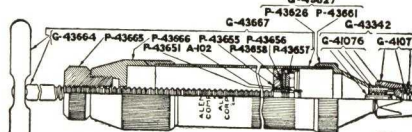
ALEMITE-DOT STANDARD SYSTEM

The Alemite-Dot Standard Lubricating System consists of compressors and fittings. The compressors have a rigid nozzle and are to be attached directly to the fittings. The

entire Alemite-Dot line is of very sturdy construction as it is made of the best materials to withstand the hard usage given in the industrial field.

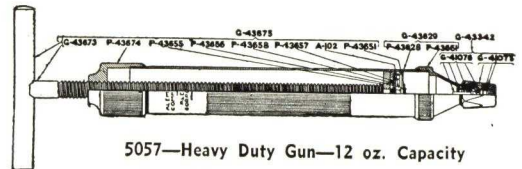


5054—Large Gun—8 oz. Capacity



5055—Nozzle-Fill Gun—8 oz. Capacity

These guns can be easily filled through the nozzle by the special Filler Tank 5047



5057—Heavy Duty Gun—12 oz. Capacity

REPAIR PARTS

A-102 Castellated Nut	P-41082 Valve Seat	P-43628 Cylinder	P-43658 Piston Spreader	G-43667 Handle, Head and Plunger Assembly
G-41075 Nozzle and Gasket Assembly	P-41087 Nozzle Body	G-43650 Handle and Screw Assembly	G-43659 Handle, Head and Plunger Assembly	G-43673 Handle and Screw Assembly
G-41076 Valve Assembly	G-43342 Nozzle Assembly	P-43651 Cotter Pin	P-43661 Bottom Cone	P-43674 Head Assembly
P-41077 Steel Washer	P-43626 Cylinder	P-43654 Head	G-43664 Handle and Screw Assembly	G-43675 Handle, Head and Plunger Assembly
P-41078 Leather Gasket	G-43627 Cylinder and Bottom Cone	P-43655 Piston Plate Washer		
P-41079 Spring	G-43629 Cylinder and Bottom Cone Assembly	P-43656 Cup Leather	P-43665 Nut	
P-41080 Valve Stem Guide		P-43657 Piston Ret. Washer	P-43666 Head	
P-41081 Valve Stem				

FOR USE ON HEAVY DUTY CONSTRUCTION MACHINERY

ALEMITE INDUSTRIAL LUBRICATION SYSTEMS

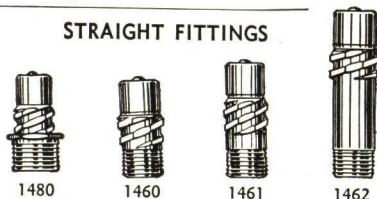
ALEMITE-DOT STANDARD SYSTEM—CONTINUED

ALEMITE-DOT STANDARD FITTINGS AND PARTS

ALEMITE-DOT STANDARD FITTINGS

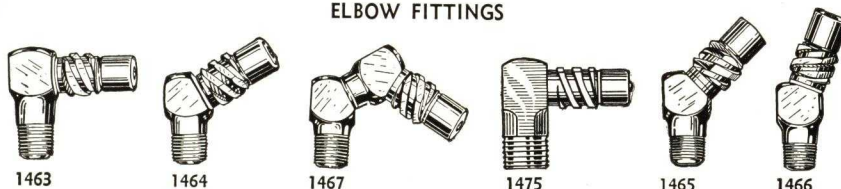
Alemite-Dot Standard fittings can be had with a single ball check for regular use; a double ball check for use on air valves and water pumps; or they can be made out of a bronze material to withstand the effects of salt water on them. The fittings are listed below according to thread size and angles.

STRAIGHT FITTINGS



- 1480 1/8" Pipe Thread Straight Fittings
 1460 1/8" P.T. Fitting, 1 1/2" long
 1461 1/8" P.T. Fitting, 1 3/4" long
 1462 1/8" P.T. Fitting, 1 3/4" long
 1517 1/8" P.T. Fitting, 1 3/4" long
 1468 1/8" P.T. Fitting, Double Ball Check
 1482 1/8" P.T. Fitting Bronze
 1480 1/4" Pipe Thread Straight Fitting
 1480 1/4" P.T. Fitting, Regular

ELBOW FITTINGS



- 60° Elbow Fittings—1/8" Pipe Thread
 1464 1/8" P.T. 60° Elbow Fitting
 1470 1/8" P.T. 60° Elbow Fitting Dbl. Ball Ck.
 1484 1/8" P.T. 60° Elbow Fitting Bronze
 60° Elbow Fittings—1/4" Pipe Thread
 1476 1/4" P.T. 60° Elbow Fitting
 Special Double Angle Fittings
 1467 1/8" P.T. 60° Double Angle Fitting
 1473 1/8" P.T. 60° Dbl. Angle Fit. Dbl. Ball Ck.
 Elbow Bodies—1/8" Pipe Thread
 P-43706 90° Elbow Body, 1/8" P.T.
 P-43712 20° Elbow Body, 1/8" P.T.
 P-43716 45° Elbow Body, 1/8" P.T.
 P-43708 60° Elbow Body, 1/8" P.T.
 Elbow Bodies—1/4" Pipe Thread
 P-43718 90° Elbow Body, 1/4" P.T.
 P-43723 20° Elbow Body, 1/4" P.T.
 P-43722 45° Elbow Body, 1/4" P.T.
 P-43720 60° Elbow Body, 1/4" P.T.
 90° Elbow Fittings—1/8" Pipe Thread
 1463 1/8" P.T. 90° Elbow Fitting
 1469 1/8" P.T. 90° Elbow Fitting Dbl. Ball Ck.
 1483 1/8" P.T. 90° Elbow Fitting Bronze
 90° Elbow Fittings—1/4" Pipe Thread
 1475 1/4" P.T. 90° Elbow Fitting
 20° Elbow Fittings—1/8" Pipe Thread
 1466 1/8" P.T. 20° Elbow Fitting
 1472 1/8" P.T. 20° Elbow Fitting Dbl. Ball Ck.
 1486 1/8" P.T. 20° Elbow Fitting Bronze
 20° Elbow Fittings—1/4" Pipe Thread
 1478 1/4" P.T. 20° Elbow Fitting
 45° Elbow Fittings—1/8" Pipe Thread
 1465 1/8" P.T. 45° Elbow Fitting
 1471 1/8" P.T. 45° Elbow Fitting Dbl. Ball Ck.
 1485 1/8" P.T. 45° Elbow Fitting Bronze
 45° Elbow Fittings—1/4" Pipe Thread
 1477 1/4" P.T. 45° Elbow Fitting

GUN FILLERS

Alemite Guns can easily be filled by the use of the following fillers. All that is necessary to fill a gun is to scoop up a quantity of lubricant into the filler, insert it in the gun barrel and then by holding the sliding piston against the barrel pull out on the filler handle. The sliding piston empties the lubricant into the gun barrel. Avoids waste of lubricant, use of a paddle, eliminates air pockets and keeps the lubricant clean.



5108—Junior
Used with 5050

5111—Heavy Duty
Used with 5054-5060-5056

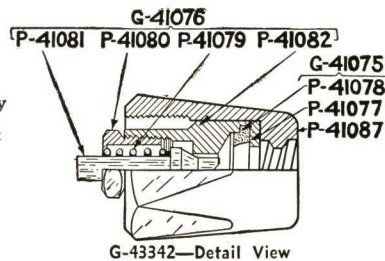


5109—Medium
Used with 5052

5110—Large
Used with 5057-5062-5059

STANDARD NOZZLE

- G-41075 Nozzle Unit
 G-41076 Valve Assembly
 P-41077 Steel Washer
 P-41078 Leather Gasket
 P-41079 Valve Spring
 P-41080 Valve Guide
 P-41081 Valve Stem
 P-41082 Valve Seat
 P-41087 Nozzle Body



G-43342—Detail View



FITTING
WRENCH

DUST
CAP



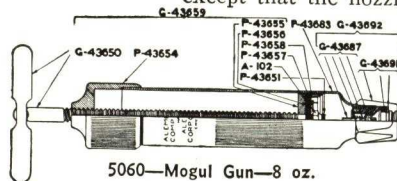
1487

ALEMITE-DOT MOGUL SYSTEM

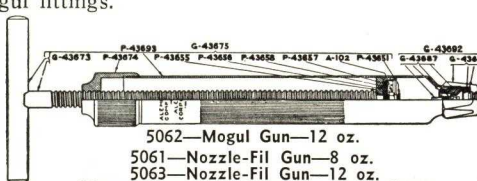
The Alemite-Dot Mogul Lubricating System is designed for hard industrial service. The fittings are larger and much stronger than the standard line. The system is designed only for industrial machines.

Mogul Guns

The Mogul Compressors are identical with the Standard Compressors except that the nozzle is larger to fit the Mogul fittings.



5060—Mogul Gun—8 oz.



5062—Mogul Gun—12 oz.

5061—Nozzle-Fil Gun—8 oz.

5063—Nozzle-Fil Gun—12 oz.

Mogul Nozzle-Fil Guns are easily filled by Filler Tank similar to 1010, page 5

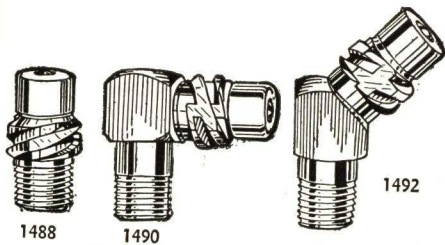
REPAIR PARTS

A-102 Castellated Nut	P-43656 Cup Leather	P-43674 Head	G-43682 Handle and Plunger	P-43688 Gasket Washer—
P-41079 Valve Spring	P-43657 Retaining Plate	G-43675 Head	Assembly	Steel
G-43650 Handle and Screw	P-43658 Spreader	G-43679 Handle and Plunger	Assembly	P-43689 Leather Gasket
P-43651 Assembly	G-43659 Handle, Cap and	G-43680 Nut	Assembly	P-43690 Nozzle Body
P-43654 Cotter Pin	P-43651 Plunger Assembly	P-43681 Head		G-43691 Nozzle and Gasket
P-43655 Head	G-43673 Handle and Screw			Assembly
				G-43692 Nozzle Assembly
				P-43693 Cylinder

FOR USE ON LINE SHAFTING, PULLEYS AND REVOLVING MACHINERY

ALEMITE INDUSTRIAL LUBRICATION SYSTEMS

ALEMITE-DOT MOGUL SYSTEM-CONTINUED



1492



1494

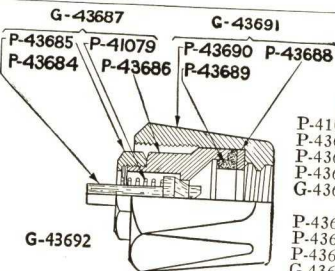
ALEMITE-DOT MOGUL FITTINGS

Alemite-Dot Mogul Fittings are very strongly made to withstand the hard industrial uses for which they are designed. They have a $\frac{1}{4}$ in. Pipe Thread. Chiefly used on cranes, mixers, bridges, etc. These fittings must be used with a gun having the Mogul Nozzle.

Straight Fittings	
1488	$\frac{1}{4}$ " P.T. Straight Mogul Fitting
1489	$\frac{1}{4}$ " P.T. Straight Mogul Fitting 1 $\frac{1}{2}$ " long
Elbow Fittings	
1490	90° Elbow Mogul Fitting $\frac{1}{4}$ " P.T.
1491	60° Elbow Mogul Fitting $\frac{1}{4}$ " P.T.
1492	45° Elbow Mogul Fitting $\frac{1}{4}$ " P.T.
1493	20° Elbow Mogul Fitting $\frac{1}{4}$ " P.T.

Elbow Fitting Bodies	
P-43748	90° Elbow Body $\frac{1}{4}$ " P.T.
P-43750	60° Elbow Body $\frac{1}{4}$ " P.T.
P-43752	45° Elbow Body $\frac{1}{4}$ " P.T.
P-43753	20° Elbow Body $\frac{1}{4}$ " P.T.

Mogul Dust Cap	
1494	Mogul Dust Cap



MOGUL NOZZLE

P-41079	Valve Spring
P-43684	Valve Guide
P-43685	Valve Stem
P-43686	Valve Seat
G-43687	Mogul Valve Assembly
P-43688	Steel Washer
P-43689	Leather Gasket
P-43690	Nozzle Body
G-43691	Nozzle Assembly

MOGUL GUN FILLERS

The following fillers are used to fill the Mogul Guns that do not have the special Nozzle-Fil feature. By the use of these fillers the guns can be easily filled without using a paddle or stick to pack the lubricant. Air pockets are avoided.

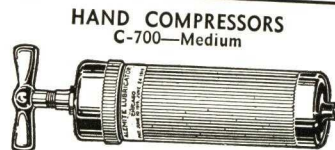
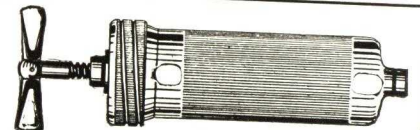


5110—Filler for 5060 Mogul Gun



5111—Filler for 5062 Mogul Gun

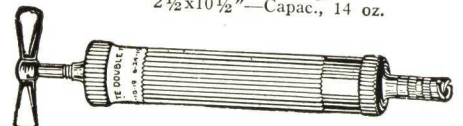
ALEMITE PIN TYPE SYSTEM

C-600—Regular
2 $\frac{1}{2}$ x8"—Capac., $\frac{1}{2}$ lb.HAND COMPRESSORS
C-700—Medium
3x9"—Capac., $\frac{3}{4}$ lb.1080—Large
2 $\frac{1}{2}$ x10 $\frac{1}{2}$ "—Capac., 14 oz.

HAND COMPRESSOR HOSE

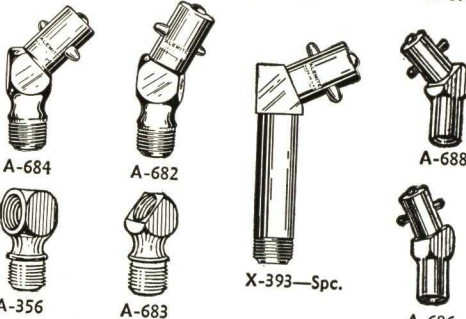
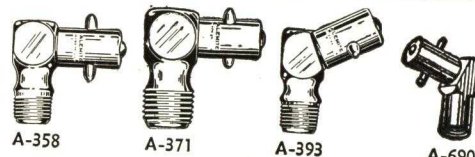


A-1039—14" Standard Hose

A-908-A—15" Heavy Duty Conduit Hose
Fittings. Finely woven wire.C-502-A—Large Double Duty—2 $\frac{1}{2}$ x10 $\frac{1}{2}$ "—14 oz.

$\frac{1}{8}$ " Pipe Thread, 90° Elbow Fittings	
A-358	$\frac{1}{8}$ " P.T. 90° EF
M-358	$\frac{1}{8}$ " P.T. 90° EF Non-corrosive
A-358-A	$\frac{1}{8}$ " P.T. 90° EF A-356 with A-345
1375	$\frac{1}{8}$ " P.T. 90° EF Burnished Seat
A-225	$\frac{1}{8}$ " P.T. 90° EF 1 $\frac{3}{8}$ " long body
1298	$\frac{1}{8}$ " P.T. 90° EF 1 $\frac{3}{8}$ " long body
1293	$\frac{1}{8}$ " P.T. 90° EF 2" body
A-426	$\frac{1}{8}$ " P.T. 90° Extension Fitting
1530	$\frac{1}{8}$ " P.T. 90° Extension El. Ftg. short body
1532	$\frac{1}{8}$ " P.T. 90° EF with Hexagon Cap
1507	$\frac{1}{8}$ " P.T. 90° EF Short Thread
$\frac{1}{8}$ " Pipe Thread, Elbow Fittings Various Angles	
A-682	$\frac{1}{8}$ " P.T. 25° EF
1378	$\frac{1}{8}$ " P.T. 25° EF 2 $\frac{1}{2}$ " long fitting
1336	$\frac{1}{8}$ " P.T. 25° EF 3 $\frac{1}{4}$ " long body
A-952	$\frac{1}{8}$ " P.T. 30° EF special
A-634	$\frac{1}{8}$ " P.T. 34° EF
A-684	$\frac{1}{8}$ " P.T. 45° EF
1302	$\frac{1}{8}$ " P.T. 45° EF 1 $\frac{1}{8}$ " long
1445	$\frac{1}{8}$ " P.T. 45° EF 3 $\frac{1}{8}$ " special
A-393	$\frac{1}{8}$ " P.T. 65°
1374	$\frac{1}{8}$ " P.T. 65°
1526	$\frac{1}{8}$ x65 EF
1292	$\frac{1}{8}$ " P.T. 65° 1 $\frac{1}{8}$ " long
X-393	$\frac{1}{8}$ " P.T. 65° 2" long
$\frac{1}{4}$ " Pipe Thread, Elbow Fittings Various Angles	
A-662	$\frac{1}{4}$ " P.T. 25° EF
A-693	$\frac{1}{4}$ " P.T. 45° EF
A-339	$\frac{1}{4}$ " P.T. 65° EF
A-371	$\frac{1}{4}$ " P.T. 90° EF
A-338	$\frac{1}{4}$ " P.T. 90° EF 1 $\frac{3}{8}$ " long
A-245	$\frac{1}{4}$ " P.T. 90° EF 3 $\frac{1}{8}$ " long fitting

ALEMITE ELBOW FITTINGS



Note: For Alemite Straight Fittings see the next page following.

Water Pump Elbow	
A-237	$\frac{1}{8}$ " P.T. 90° EF Water Pump
A-415	$\frac{1}{8}$ " P.T. 45° EF Water Pump

Female Fittings—Elbow	
A-686	$\frac{1}{8}$ " P.T. 25° Fem. EF
A-688	$\frac{1}{8}$ " P.T. 45° Fem. EF
A-690	$\frac{1}{8}$ " P.T. 65° Fem. EF
A-384	$\frac{1}{8}$ " P.T. 90° Fem. EF
A-165	$\frac{1}{8}$ "-20 M.T. EF 90°

Special Fittings	
A-218	$\frac{1}{4}$ "-32 M.T. 90° EF
A-219	$\frac{1}{4}$ "-20 M.T. 90° EF
A-378	$\frac{1}{8}$ "-32 M.T. 90° EF
A-188	$\frac{3}{8}$ "-24 M.T. 90° EF

Elbow Bodies	
A-356	$\frac{1}{8}$ " P.T. 90° Elbow Body
A-224	$\frac{1}{8}$ " P.T. 90° Elbow Body 1 $\frac{3}{8}$ " long
A-681	$\frac{1}{8}$ " P.T. 25° Elbow Body
A-683	$\frac{1}{8}$ " P.T. 45° Elbow Body
A-392	$\frac{1}{8}$ " P.T. 65° Elbow Body
A-366	$\frac{1}{4}$ " P.T. 90° Elbow Body
A-383	$\frac{1}{8}$ " P.T. Female Elbow Body 90°
A-687	$\frac{1}{8}$ " P.T. Female Elbow Body 45°
A-164	$\frac{1}{8}$ "-20 M.T. EF Body 90°
P-41338	$\frac{1}{8}$ " 90° Elbow Body 2" long

USE ALEMITE-DOT MOGUL SYSTEM FOR HEAVY DUTY POWER SHOVELS

ALEMITE INDUSTRIAL LUBRICATION SYSTEMS

ALEMITE PIN TYPE SYSTEM—CONTINUED

Female Straight Fittings

A-387	$\frac{1}{8}$ "-27 M.T. Female St.
A-382	$\frac{1}{8}$ " P.T. St. Regular, Female
A-856	$\frac{1}{8}$ "-27 M.T. Female St.
1255	$\frac{1}{4}$ " P.T. Female St.

Waterpump Fittings—Male

A-850	$\frac{1}{8}$ " P.T. Waterpump St.
A-299	$\frac{1}{4}$ " P.T. Waterpump St.
1397	Double Ball Check W.P. Fitting

Rivet Fittings

1366	$\frac{1}{8}$ " Rivet Fitting
A-350	$\frac{1}{4}$ " Rivet Fitting

Special Thread Fittings

A-212	$\frac{1}{4}$ "-20 M.T. St.
1330	$\frac{1}{4}$ "-20 M.T. St. 1 $\frac{7}{8}$ " long
A-232	$\frac{1}{4}$ "-24 M.T. St.
A-210	$\frac{1}{4}$ "-32 M.T. St.
A-319-A	$\frac{1}{8}$ "-18 M.T. St.
A-248	$\frac{1}{8}$ "-20 M.T. St.
A-475	$\frac{1}{8}$ "-24 M.T. St.
A-273	$\frac{1}{8}$ "-32 M.T. St.
A-214	$\frac{3}{8}$ "-16 M.T. St.
A-171	$\frac{3}{8}$ "-24 M.T. St. 1" long
A-163	$\frac{1}{2}$ "-20 M.T. St.

STRAIGHT FITTINGS



A-336



A-310



A-425



A-536-A



A-382



1255



A-359



A-850

Female Fittings

$\frac{1}{4}$ " P.T. Fitting

$\frac{1}{8}$ " Pipe Thread Fittings

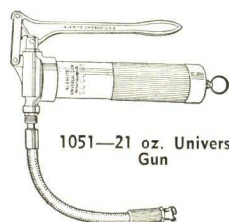
A-345	Arranged according to length of fitting
A-345	$\frac{1}{8}$ " P.T. Short St. $\frac{3}{4}$ " long
A-345-D	$\frac{1}{8}$ " P.T. Short St., less Ball and Spring
A-310	$\frac{1}{8}$ " P.T. Round St. 1" long
A-332	$\frac{1}{8}$ " P.T. Short St. 1" long with Duroil Disc
A-336	$\frac{1}{8}$ " P.T. St. Regular
M-336	$\frac{1}{8}$ " P.T. St. Non-corrosive
1529	$\frac{1}{8}$ " P.T. St. with Threaded Cap
A-425	$\frac{1}{8}$ " P.T. St. 1 $\frac{1}{4}$ " long, round
A-201	$\frac{1}{8}$ " P.T. St. 1 $\frac{3}{8}$ " Hex.
1234	$\frac{1}{8}$ " P.T. St. 1 $\frac{1}{2}$ " long, round
A-536-A	$\frac{1}{8}$ " P.T. St. 2" long, round
1240	$\frac{1}{8}$ " P.T. St. 2 $\frac{1}{4}$ " long, two piece
A-197	$\frac{1}{8}$ " P.T. St. with Extension Tube 2 $\frac{3}{4}$ " long

$\frac{1}{4}$ " Pipe Thread Straight Fitting

A-359	$\frac{1}{4}$ " P.T. St. Regular
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$\frac{3}{8}$ " Pipe Thread

A-238	$\frac{3}{8}$ " P.T. St.
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1051—21 oz. Universal Gun



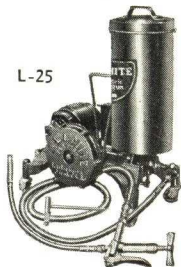
1054—15 oz. Alemite-Gat Gun

ALEMITE-GAT HANDY SHOP GUNS

These guns combine the best features thus far known in Handy Shop Gun design. Each is different and used for different purposes: The All-in-One Guns have the double feature of volume per stroke and extremely high pressure whenever needed; the Universal Gun is primarily a volume gun delivering one-half ounce of lubricant per stroke; the Alemite Gat Gun is a high pressure gun. All are easily filled by removing head from cylinder, inserting open end of cylinder into lubricant and pulling back the thrust rod or chain follower. The powerful suction created fills the cylinder with lubricant and by replacing the head, gun is ready for use.

SERVICE COMPRESSORS

L-25



Lubrigun No. L-25

Operates from any electric outlet or socket. Current and cycle must be specified. Semi-automatic in operation. Develops 5000 lbs. pressure at coupling. Capacity, 25 lbs. Complete with 7-ft. rubber hose, booster release valve, rubber whip and hose and connection for use with Push-type systems.

Lubrigun No. L-75

Similar to L-25 but holds 80 lbs. of lubricant making it satisfactory for use as a stationary gun. Will take care of 3 or 4 lubricant leads. Hose leads must be ordered separately. Cycle and current must be specified.

L-75



Giant Compressors

Made in two types: P-100 and P-400 pneumatic and S-100 and S-400 steam, in 100 and 400-lb. capacities each. P-100 will deliver 7 lbs. of lubricant per min. at 100 lbs. pressure. Where steam is available the steam compressors may be used. They deliver approximately 20 lb. lubricant per min. at 100 lbs. steam pressure. Giant Compressors can be used with one or more outlets. Hose assemblies are extra.

P-100



Positive Primed Compressors

PA-100 is recommended for handling heavy lubricants. It has an air ram inside lubricating tank, which forces lubricant out of tank into plunger chamber thence to destination by plunger driven by air motor. Capacity 16 $\frac{1}{2}$ lbs.

PA-400 is identical to PA-100 but has a capacity of 400 lbs. of lubricant, taking a complete drum.

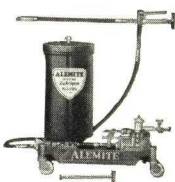
PA400



Airline Lubrigun—5346

A portable, air operated, automatic, high pressure unit of 33 lbs. capacity. It is simple in design and operates by a powerful double-acting air motor developing high lubricant pressure. Equipped with standard Alemite hose outlet, 7-ft. rubber hose and 2-ft. whip end hose.

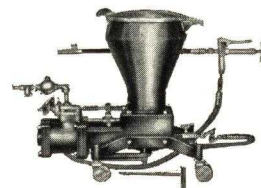
5346



Heavy Duty Compressor—5370

Designed to pump extremely heavy and fibrous lubricants. Has double-acting air motor which pumps lubricant at a pressure of 32 times the air pressure used: Capacity, 25 lbs. Equipped with universal volume swivel, 10-ft. volume hose, swivel coupling and 2-ft. whip end hose.

5370



THERE ARE ALEMITE SERVICE COMPRESSORS FOR EVERY INDUSTRIAL PURPOSE

ALEMITE INDUSTRIAL LUBRICATION SYSTEMS

ALEMITE METRO-MATIC SYSTEM

THIS is a multiple pipe line system for lubricating heavy industrial machinery that forces the lubricant into all bearings while the machine is running. This system provides a number of distinct advantages, including:

(1) Every bearing is positively and thoroughly lubricated with a measured amount of lubricant without stopping the machine.

(2) Any number of branches may be taken off at any point in the system—each bearing gets the lubricant at the same time the one nearby does.

(3) No bearing can be missed—repairs are reduced to the minimum and the life of bearing and machine are greatly prolonged.

(4) Simplicity in operation is the keynote—there are no combinations to remember—just pump the handle a few times a day and the system takes care of the rest.

(5) Since the personal hazard to the workmen is greatly reduced, general efficiency is correspondingly increased.

(6) No lubricant is wasted and the appearance of the plant is improved by the elimination of all oil drippings.

Description and Operation of the System

The Alemite Metro-Matic Lubrication System uses a pipe line arrangement whereby the lubricant is forced under high pressure to each bearing on the machine. A measuring valve, located on the pipe line near the bearing, discharges a predetermined amount of lubricant at each operation of the pump handle.

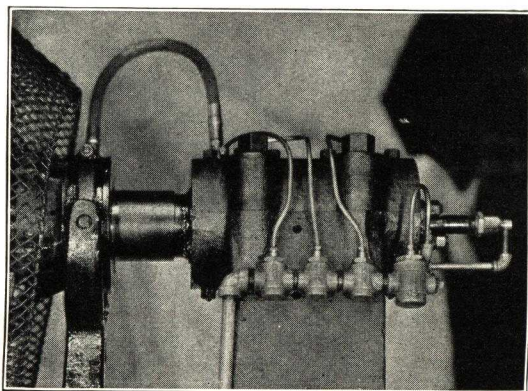
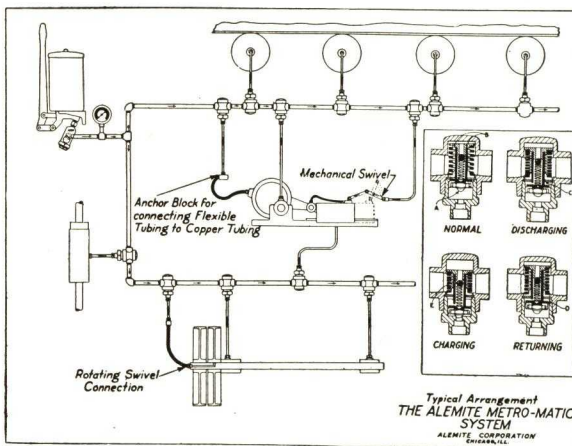
A short length of copper tubing conducts the lubricant from the measuring valve on the pipe line to the bearing, and it is the unique operation of these measuring valves that makes this system of lubrication so outstanding. It is absolutely different from any other system on the market today, in that there is no condition under which the lubricant can bypass into the line—it *must* go into the bearing. Also the measuring valves located on the pipe line are connected in multiple, and as many branches as necessary can be taken off at any point where other bearings need to be supplied.

To operate the machine, merely pump up a pressure of 2000 pounds in the compressor and then release the valve. This operation has done two things in the lubricating system. A new and measured shot of clean lubricant has been forced into each bearing, and the continued pressure has forced a new load of lubricant into all the vacuum chambers, thereby charg-

ing the measuring valves for the next discharge operation. A glance at the accompanying illustration will show the operation of the measuring valve. From the previous operation there is already a supply of lubricant in chamber A, sufficient to thoroughly lubricate the bearing. When the pressure is increased throughout the system, the plunger B is forced downward causing lubricant in A to pass down the copper tubing to the bearing. As the plunger goes down, a vacuum is created in C, which space gets larger the farther down plunger B is forced. When the plunger is down as far as it can go and the lubricant is in the bearing, the increasing pressure in the pipe line forces the lubricant past the

ball check valve E and down into chamber C. Then, as the pressure is released throughout the system, the plunger B rises and the lubricant directly above it can go no place else except past the leather jacket D into the bottom chamber A. There it stays until the next working of the compressor, when the whole operation is repeated.

There is nothing to get out of order, nothing to fail—everything is automatic and exactly measured. No time is lost in shutting down the machine—every bearing gets its right amount of clean, fresh lubricant every time the system is operated.



Close-up Showing Flexible Hose Connection, Measuring Valves and Rotating Swivel

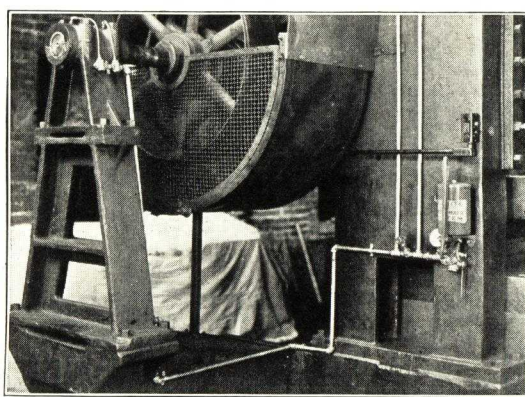


Illustration Showing Metro-Matic Pump, Gauge and Shut-off Valve

FOR LUBRICATING HEAVY DUTY INDUSTRIAL MACHINERY

ALEMITE LUBRICANTS

ALEMITE INDUSTRIAL LUBRICANTS

ALEMITE FLUID LUBRICANT

A calcium base lubricant and, as its name implies, is fluid. It has many uses. It may be used in chain oiling motors and generators of the larger type, operating at variable speeds and loads. It is excellent for use in saturating wool yarn, waste and yarn elastic used on underfeed bearings of the M. C. B. type. It is an admirable lubricant for replacing oil, which may be applied through the medium of oil cans where drive fittings have not been installed. One drop of this lubricant will last longer and lubricate better than four to six drops of the best lubricating oil.

ALEMITE INDUSTRIAL LUBRICANT

A calcium base lubricant of medium consistency, made up of pure animal fats, and an oil of 400 sec. viscosity at 100° F. It is water repellent and may be used in contact with water. It contains no grit or solids to cut away the bearing surfaces, and will not cake or gum in the lubricant grooves. It is especially recommended for the following uses:

1. In all high pressure systems.
 2. On all small to medium plain bearings operating at either high or low speeds, and for all ball bearings where balls are employed up to $\frac{3}{8}$ in. regardless of speed or loads.
 3. For the saturation of wool yarn used in open boxes where temperatures do not exceed 185° F.
 4. For the lubrication of all bearings on an extended line where lubricant is fed from a central station and carried through pipes of $\frac{1}{4}$ in. inside diameter or less for a distance of 75 feet or more.
 5. For many types of Roller Bearings.
- It may be applied with any Alemite equipment. It is necessary to make but one application of this lubricant where it has been customary to apply ordinary greases three or four times.

ALEMITE LUBRICANT NO. 33

In the same category, as far as makeup is concerned, as the regular Alemite Industrial Lubricant, but it is of a slightly heavier consistency. It has been designed for heavier duty service than the other. Its temperature range is from 25° below zero to 200° F.

ALEMITE GRAPHITE LUBRICANT

About the same consistency as that of Alemite Lubricant No. 33. We use a very high grade of pure, powdered flake graphite in its manufacture, which is free from all abrasives. The chief claims for good, flake graphite are the smoothing out of scored surfaces, due to the small holes being filled with graphite which forms a smooth, metal-like film.



400-Lb. Drum with
Truck

The adhesiveness of this lubricant is slightly better than the regular Alemite Lubricants.

ALEMITE LUBRICANT W. B. NO. 1

A calcium base lubricant of a still heavier consistency than either Alemite Industrial Lubricant or Alemite Lubricant No. 33. Because of this it should be used for heavy duty service and is most satisfactorily applied with the Alemite Dot System. It is serviceable at temperatures up to 210° F. It may be used on large roller bearings of $1\frac{1}{2}$ in. diameter or more, which are subjected to heavy duty and operate at speeds not in excess of 300 r.p.m.

ALEMITE HIGH TEMPERATURE LUBRICANT

A sodium base lubricant designed especially for use on bearings subjected to high frictional and artificial temperatures. It will not carbonize and leave a residue in the bearing, even under very high temperatures. It is an excellent lubricant for ball bearings of $\frac{3}{8}$ in. and larger diameters, regardless of heat conditions, and may be applied with Alemite Pin Type or Push Type Compressors, or may be used in hand and spring automatic grease cups. It is excellent for the lubrication of high speed woodworking machinery and other machinery of similar character operating at unusually high speeds.

ALEMITE PYRO LUBRICANT

Very similar in its makeup to Alemite High Temperature Lubricant. It is of a slightly heavier consistency and is satisfactory at temperatures up to 380° F. It is an ideal lubricant for all bearings where the operating temperatures fall within this range.

ALEMITE BLOCK LUBRICANTS

Made in two grades, dark and light, with respective melting points of 370° and 400° F. These lubricants are of an entirely different character from the Alemite Lubricants mentioned above and, as their name implies, are of a solid character and are in the same category as the other sodium base lubricants. They are to be used on bearings of the open box type, where the lubricant rests directly on the shaft. They are especially adapted for use in the paper and cement industries.

ALEMITE FIBROUS LUBRICANT

Can be used to advantage on bearings where the conditions and design require the use of a fibrous lubricant. It has a sodium base with a melting point of approximately 270° F., is free from acid, excess alkali, fillers and abrasives. It does not pit bearing contacts and lasts longer in bearings because of its composition and structure. Used extensively for lubricating universal joints.

ALEMITE GEAR LUBRICANTS

ALEMITE GEAR LUBRICANT NO. 2

A strictly fluid calcium base gear lubricant that is made from an oil of 900 viscosity at 100° F., compounded with pure animal fats. It is recommended especially for small, encased gears operating at high speeds under light loads where low temperature conditions prevail. It is of a slightly thinner consistency than Alemite Special Gear Lubricant.

ALEMITE SPECIAL GEAR LUBRICANT

A straight run oil and has a viscosity of 5,000 sec. at 100° F. and 200 sec. at 210° F., and a pour test of approximately 10° F. It is a strictly fluid lubricant with a fine, heavy body that is recommended for use on light duty and small encased gears operating in a bath at either high or low speed under light loads.

ALEMITE EXTREME PRESSURE LUBRICANTS

Alemite Heavy Duty Gear Lubricant S. A. E. 160—Our heaviest type of Extreme Pressure Lubricant, although it is of a semi-fluid nature. It will withstand extreme pressure due to chemically combined sulphur. It has a pour test of approximately 5° above zero.

Alemite Extreme Pressure Lubricant S. A. E. 110—Has the same characteristics as Heavy Duty Gear except that it is lighter in body and has a pour test of zero.

Alemite Extreme Pressure Lubricant S. A. E. 90—Is of the same family—has a lighter body—and has a pour test of 10° below zero. These lubricants are all for use in small and medium high speed and herringbone type gears, and by virtue of their great pressure-resisting qualities and cooling effects they are admirably suited for industrial uses where the gear cases are leakproof.



100-Lb. Drum with
Truck

ALEMITE GEAR LUBRICANT NO. 3½ (SEMI-FIBROUS)

A semi-fluid gear lubricant that may be used at temperatures of from 30° F. to 250° F. It has a very heavy body that will stand up under hard usage. It is ideal for medium sized and fairly large encased gears, operating at medium and slow speeds under comparatively heavy loads, and for light duty, open gears, operating at slow speeds.

ALEMITE GEAR LUBRICANT NO. 6

A heavy, fibrous, solid base gear lubricant that has been designed for heavy duty service and is recommended for use in encased gears where moisture is excluded at temperatures ranging from 200° F. to 300° F. It may also be used satisfactorily on similar gears operating under normal temperatures.

ALEMITE LEAD BASE LUBRICANT NO. 8

A fluid, lead base lubricant with a mineral oil content of the highest character. Its lubricating qualities are unexcelled and it is admirably adapted for the lubrication of reduction gears of all types. It is most efficient on all types of worm gears operating under all conditions.

ALEMITE GEAR LUBRICANT NO. 329

A very heavy, straight-run oil with a viscosity of 300 secs. at 210° F. It is admirably suited for open gears, tractor work, and is well suited where a chain drive lubricant or a wire rope lubricant is desired. In fact there are many uses in the industrial field for a lubricant of such a heavy viscosity.

GOOD LUBRICANTS MEAN LOWER OPERATING COSTS

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Baltimore, Md.	Alemite Co.	1901-3-5 Oak Street
Birmingham, Ala.	Alemite Co.	2230 Second Avenue, So.
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Pittsburgh, Pa.	Alemite Co.	5636 Baum Boulevard
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Richmond, Va.	Alemite Co.	Broad and Meadow Streets
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CANADIAN FACTORY

STEWART-WARNER—ALEMITE CORP. OF CANADA, LTD.

Belleville, Ontario, Canada, Ltd., Distributors



THE OHIO GREASE COMPANY

Manufacturers of the Ohio Brand of Lubricating Greases and Oils

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CHARLOTTE, N. C.

Lubricating Greases and Oils

A complete line of High Grade Industrial and Automotive Lubricants—Greases and Oils for every purpose, including the lubrication of all kinds of cylinders, bearings, gears, slides, ropes, etc.



Lubricating Devices

Grease Compressors, Grease Guns, Grease Cylinder Lubricators and Grease Cups.

Ohio Greases

Ohio Cylinder Grease—A superlative steam cylinder lubricant. Consists of the best grade of Pennsylvania cylinder stock, properly prepared, scientifically compounded with acidless tallow oil, and highly concentrated. Will greatly improve results and economy on any steam unit regardless of steam or operating conditions.

Feeding Instruments—Such instruments as may be required to feed Ohio Cylinder Grease to the best possible advantage are furnished free for the purpose.

Ohio Cup Grease—A superior lubricant for use through grease compression cups. Contains no fillers and does not discolor with age. Made in six consistencies.

Ohio Shafting Grease—An ideal and very economical lubricant for line shafting and other high speed bearings. Made in four consistencies. Cups furnished free to feed it.

Ohio Pressure Gun Grease—For use through pressure guns on the bearings of autos, trucks, tractors, and industrial machinery. Exceptional lasting and lubricating qualities.

Ohio Roller Bearing Grease—A soft grease with excellent wearing qualities. Will not gum, and leaves no deposit. Consistencies for roller bearings of all types.

Ohio Journal Grease—A most efficient lubricant for use on ring oiling bearings that are steam heated, or on hot bearings of any kind. Also used to saturate woolen waste for journal box lubrication.

Ohio Mine Car Grease—An exceptionally good, low cold test lubricant, for roller bearing type of mine car wheel. The thinner consistencies are also suitable for plain bearing, reservoir type wheels.

Ohio Graphite Grease—For special service we mix a high grade lubricating graphite with Ohio Cup Grease in any consistency desired.

Ohio Mica Grease—Some of our customers prefer powdered mica instead of graphite in their grease, and for such this lubricant is prepared.

Ohio Fibre Grease—A moderately high melting point lubricant of spongy or fibrous nature. Particularly adapted for bearings that are exposed to heat.

Ohio Block Grease—A solid lubricant sold in barrels or in blocks as desired. Has a high melting point

and is used on steam heated bearings of paper mill machinery.

Ohio Rope Grease—A perfect lubricant and preservative for steel or manila hoisting and haulage ropes, elevator and crane cables, etc. Two consistencies.

Ohio Gear Grease—For light, medium or heavy gears of all kinds. Particularly suitable for gears that are not encased, and for gears that are exposed to the weather. Made in three consistencies.

Ohio Gear Shield—Not so much a lubricant as it is a very viscous or sticky protective coating for the teeth of large exposed gears in heavy, rough service. Made in three consistencies.

Ohio Loco Rod Grease—A light green viscous bearing grease made in very heavy consistencies only. Some of these are about as hard as soap, and are particularly suited for locomotive rod lubrication.

Ohio Crank Pin Grease—A dark green viscous cup grease made of cylinder stock. Will not gum, dry up, or run off. Excellent for crosshead guides, elevator slides, and difficult bearing lubrication.

Ohio Wool Greases—Wool yarn, wool waste or wool elastic are saturated with high grade greases for the lubrication of journal boxes on industrial and railroad equipment.

Ohio Neck Greases—Hot and cold neck greases are heavy, dark colored lubricants made especially for use on the necks of rolls in steel mills.

Ohio Auto Grease—The paramount lubricant for the transmission and differential gears of autos and motor trucks. Also for housed or encased gearing on any kind of machinery. Made in three consistencies.

Ohio Can-Gun

A high pressure grease compressor for industrial use. Takes grease from a 10-lb. can and forces it through feed lines to any number of bearings.

Ohio Oils

Ohio Motor Oil—A pure Pennsylvania, paraffin base motor oil of the highest possible quality. Suitable for all kinds of automobiles, busses, taxis, trucks, tractors, aeroplanes, etc. Made in six consistencies.

Hilo Motor Oil—A fine grade Mid-continent paraffin base motor oil. Excellent lubricating and lasting qualities. Second only to our "Ohio" brand. Six consistencies.

Ohio Engine Oils—A series of quality oils for the lubrication of engine bearings; and for the cylinders of oil engines, gas engines, and gasoline engines.

Ohio Compressor Oils—Several grades for the lubrication of air, ammonia, gas, chemical and other types of compressor cylinders.

Ohio Penetrating Oil—A very thin paraffin base oil for automobile springs. Loosens rusted nuts, etc. Removes road tar.

Ohio Hotzone Oil—For upper motor lubrication. Also for mixing with gas and oil while breaking in new cars. Made with or without colloidal graphite, as desired.

Miscellaneous Oils—For sewing machines, typewriters, small electric motors, fans, sweepers, guns, reels, etc.

PRECISION INSTRUMENTS

AMERICAN METER COMPANY

INCORPORATED

Measurement and Control of Gas, Oil, Steam, Air and Liquids

General Offices: 105 West 40th Street, NEW YORK, N. Y.

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BOSTON
PHILADELPHIACHICAGO
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SAN FRANCISCO

Products

IRONCASE and TINNED STEELCASE POSITIVE DISPLACEMENT METERS; GAS and AIR REGULATORS; INTEGRATING, INDICATING, and RECORDING FLOWMETERS; INDEXES; RATE-VOLUME CONTROLLERS; LIQUID LEVEL RECORDERS and CONTROLLERS; METER PROVING; LABORATORY WET and DRY TEST METERS, etc.



Ironcase Meters

The reasons for the accuracy of Ironcase Meters are very definite . . . a degree of accuracy making possible the successful measurement of the smallest pilot's flow as well as the maximum capacity of the largest high pressure installations.

One-piece body design (case, body, channels and partition cast as one unit) abolishes machined joints, paste and gaskets between those members, affording greatest protection against internal leakages. The selected gray iron used is insurance against corrosive action.

A complete line ranging from the small low pressure 5-B type to maximum high pressure meters.

Catalog EG40 gives all details of construction, capacities, etc.

Indexes

Every index requirement is covered, including straight reading indexes and indexes for reading Butane and other units.

The *Base Pressure Index* automatically multiplies the quantity of gas passing through the displacement meter, at pipe line conditions, by the factor of the line pressure divided by the base pressure. The result is continuously registered on a straight reading index.

Engineering bulletin E-12 on request.

The *Base Volume Index* multiplies the volume by the pressure factor and subsequently by the temperature factor so that the volume indicated by the index is the volume in standard units.

Any *Volume and Pressure Gage* supplied by AMERICAN METER COMPANY can readily be installed on the top of the *Base Pressure Index* or *Base Volume Index* as well as ordinary indexes. The chart serves as a permanent hourly record of flow and pressure.

Bulletin E-6 fully describes the complete line of Volume and Pressure Gages.



Base Pressure Index

Shown above with Volume and Pressure Gage

Integrating Orifice Meters and Flowmeters

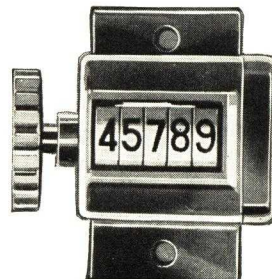
Gases—Air—Steam—Oil and Other Fluids

The *Integrating Orifice Meter* gives a totalized indication of the quantity which has passed through

the orifice for all rates of flow and all variations of pressure.

It is the only device which integrates for static pressure as well as for differential.

In this integrator the effect of the pressure on the rate of the volume is continuously applied for any value or change in pressure from the perfect vacuum to maximum pressure. Therefore, multi-



pliers or factors for change in pressure are not required. It is not necessary to regulate a pressure in order to assume that it is constant.

This integrator multiplies the square root of the differential by the square root of the absolute pressure. The result is continuously totalized on a counter index.

The *Integrating Flowmeter* is the Metric Orifice Meter without pressure spring, equipped with an integrator which gives a totalized indication of the quantity of gas or steam at constant pressure or of liquids regardless of the rate. Bulletin E-16 gives full details of operation and applications of these integrating meters.

Rate-Volume Control

Gases—Air—Steam—Oil—Water and Other Liquids

The Metric Controller maintains rate of flow of gases or liquids at a predetermined maximum value by automatically controlling the differential produced by the rate of flow through an orifice.

Features—The Metric Rate-Volume Controller is rugged, yet extremely sensitive. The differential gage portion of the instrument responds quickly to any change in the rate of flow. The movement of the differential pen shaft is positive and promptly operates the valve of the control block which modifies the pressure on the diaphragm of the regulator, thereby accurately controlling the rate of flow by varying the opening in the regulator. The design of this quick-acting differential gage and control block eliminates "hunting" or great variation in the instantaneous rate of flow. There is no continuous leak.

The control block consists of only six parts—block, valve, valve stem, valve seat, leak screw, and leak screw locknut. These parts are assembled in one piece which can be removed easily for cleaning or repair without disturbing the connecting lines or levers. The valve seat and valve are easily removed for cleaning. The block can be replaced by another block without change in adjustment. Furthermore, the same block can be used with the open type or the closed type of regulator by making two minor adjustments. Write for bulletin E-5.

Metric Liquid Level Control and Recorder

The Metric Liquid Level Control can be used to control the liquid level in a tower of any hot or cold liquid. The valve for controlling the rate of flow is put in the pipe line feeding liquid to the tower, or in the liquid line from the tower. If a steam pump is used, the valve is placed in the steam line to the pump. This control will give a record of the elevation of the surface of the liquid in the tower or column. Details of construction, operation and application are given in bulletin E-10; mailed on request.

BUFFALO METER CO.

Manufacturers of Positive Displacement Type Water, Oil, Gasoline Meters and Meter Accessories

2915 Main Street, BUFFALO, N. Y.

Products

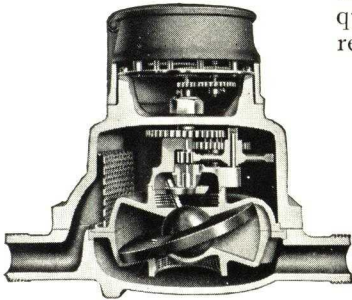
WATER METERS, OIL METERS, GASOLINE METERS, HOT WATER METERS.

Also manufacturers of Strainers; Portable Testing Water Meters; Jet Meters for regulating flow to flush tanks; Curb Boxes for extension dial meters; Meter Reading Books; Office Meter Record Books; Air Release Valves.

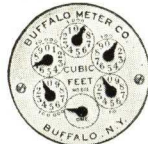
Niagara and American Water Meters

Niagara and American water meters are used wherever accurate automatic measurement is needed. They are regularly used by 2500 waterworks, and by many of the largest industrial companies for preventing water waste and charging users with exact amount consumed.

The Niagara meter has the main casing made of fine gray cast iron, hand dipped in molten zinc. The casing of the American meter is cast bronze. Working parts and standards of quality in both meters are exactly the same. They are both fine quality meters in every respect.



Sectional View 5/8-in. Meter



Round Reading Register



Straight Reading Register

Choice of round or straight reading registers

Working parts of these meters are unusually simple and long lived. The Niagara meter is especially designed for measuring hard or corrosive water, or for operating at high pressure, and has no equal under such conditions of service. Both meters are made in a complete range of sizes as shown below. The meters may have either round reading or straight reading registers indicating cubic feet, gallons or litres. Write for catalog.

*GROSS PRICE LIST, NIAGARA AND AMERICAN WATER METERS

Size of meter, in.	Greatest proper capacity, U. S. gals. per min.	Niagara meter only with zinc-coated iron outside case	Niagara meter only with zinc-coated iron case and breakable frost bottom	American meter only with all-bronze outside case	American meter only with bronze main case and breakable frost bottom	Brass couplings per pair, extra
5/8x1 1/2	20	\$ 16.00	\$16.00	\$ 20.00	\$18.00	\$1.00†
5/8x3/4	20	16.00	16.00	20.00	18.00	1.50†
1	34	24.00	24.00	30.00	27.00	1.50†
1 1/4	53	35.20	35.20	44.00	39.60	2.20†
1 1/2	75	48.00	48.00	60.00	54.00	3.00
2	100	64.00	64.00	80.00†	72.00	4.00
2 1/2	160	96.00	96.00	120.00†	108.00	6.00
3	240	140.00	140.00	175.00	157.50	8.75
3 1/2	315	200.00	200.00	240.00	216.00	Flanges
4	375	240.00	240.00			no charge
4 1/2	500	400.00	400.00			no charge
6	1000	800.00	800.00			no charge

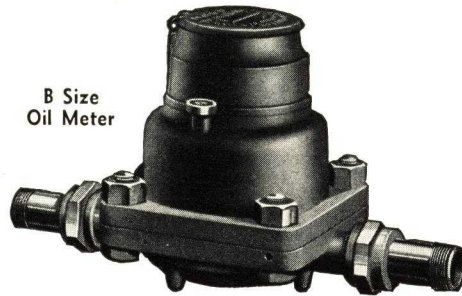
*Subject to discount.

†1 1/2-in. and 2-in. all-bronze case meters may be furnished with internal standard pipe threads when specially ordered.

‡In these sizes, quarter bent couplings may be furnished at the following prices per pair: 1/2-in., \$1.50; 3/4-in., \$2.00; 1-in., \$3.00.

Niagara Oil and Gasoline Meters

Niagara oil meters are used to measure gasoline, fuel oil, lubricating oil and all other oil products. They will operate by pump or gravity pressure of 1 lb. or more per square inch and with oil at any temperature. All Niagara



B Size Oil Meter



Straight Reading Register

meters measure by positive volumetric displacement assuring extreme accuracy over a wide range of flows. Meter register reads direct in U. S. gallons, Imperial gallons, or litres. See table below. Write for catalog.

Niagara Hot Water Meters

The Niagara hot water meter is similar in design to the Niagara oil meter, but has works of special construction to run in water at any temperature up to 250° F. Let us quote on your particular needs.

SIZES, CAPACITIES AND PRICES, NIAGARA OIL AND HOT WATER METERS

Size of meter	*Size of pipe connections, in.	†Oil and gasoline capacity limits, U. S. gal. per hr.	‡Hot water flow range U. S. gal. per min.	§List prices, subject to discount
A	1/2	2 to 300		\$ 20.00
B	1/2 or 3/4	100 to 500	2 to 4	20.00
BNV	3/4	240 to 960		23.00
C	3/4 or 1	250 to 1000	3 to 6	30.00
CNV	1	360 to 1500		33.00
DV	1 or 1 1/4	400 to 1600	5 to 10	44.00
EV	1 1/4 or 1 1/2	600 to 2400	7 to 14	60.00
FV	1 1/2	800 to 3200	9 to 18	80.00
GV	2	1000 to 4000	13 to 26	120.00
G	2 or 2 1/2	1600 to 6400	20 to 40	160.00
GX	3-in. flanges	1600 to 6400	20 to 40	200.00
IV	3-in. flanges	3000 to 12000	30 to 60	240.00
JV	4-in. flanges	5000 to 20000	50 to 100	400.00
LV	6-in. flanges	10000 to 40000	80 to 160	800.00

*The size of meter to use is determined by the flow to be measured, not the pipe size. Special accuracy regulator may be had on most sizes.

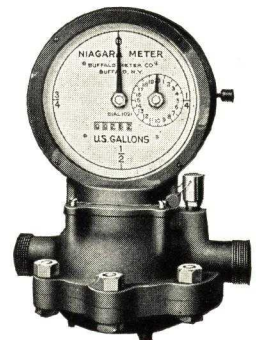
†Meters used only occasionally may be run on higher flows than those given, but for general use these limits should be observed.

‡All sizes except "A" can be furnished with special register having 6-in. diameter vertical dial for \$20.00 list price additional.

Niagara Vertical Dial Meters

Where liquid is measured in separate lots, vertical dials allow quick easy reading, with setback of the hand to zero after each run. Total figures can not be set back.

Vertical dials may be fitted on all meters except the A size. Many models of dials to meet every need. Write for prices.



Vertical Dial Meter

BAILEY METER COMPANY

1044 Ivanhoe Road, CLEVELAND, OHIO

BOSTON NEW YORK PHILADELPHIA BUFFALO PITTSBURGH ERIE CINCINNATI ATLANTA CHICAGO
MILWAUKEE ST. LOUIS ST. PAUL KANSAS CITY HOUSTON DENVER SAN FRANCISCO SEATTLE

BAILEY METER COMPANY LTD., MONTREAL, QUE., CAN.
WINNIPEG

Bailey Products

AUTOMATIC CONTROL; BOILER PANELS; BOILER METERS; MULTI-POINTER GAGES; BOILER WATER LEVEL RECORDERS; COAL METERS; FLUID METERS; RECORDERS; LONG DISTANCE INDICATORS; COMBUSTION CONTROL; FEED WATER CONTROL; FEED WATER REGULATORS; METER PANELS; WEIR METERS; SEWAGE METERS; TUBING and COMPRESSION FITTINGS; GAS METERS.

Also manufacturers of Draft Recorders; Drainage Control; Gravity Recorders; Liquid Level Gages; Manometers; Pump Governors; Tachometers; Test Water Cooling Coils.

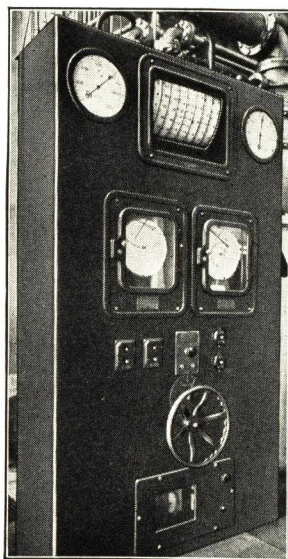
All manufactured under the trade-name "Bailey."

Boiler Panel

Designed to give complete information for controlling the operation of any boiler.

The panel contains a Bailey Boiler Meter, a Bailey Fluid Meter with which is combined a Boiler Water Level Recorder, and a Bailey Multi-Pointer Gage. The type of each depends upon the operating conditions in each case.

All factors of primary importance are recorded on 12-in. uniformly graduated meter charts and secondary factors are indicated on illuminated scales immediately above, so that the boiler operator has everything right before him to obtain desired capacity and best efficiency at all times.



Bailey Boiler Panel

Boiler Meter

Records and integrates *steam flow* from boiler, records *air flow* supplied for combustion, and records *flue gas temperature*.

Through the *steam flow—air flow* relation, the meter shows preventable losses as soon as they occur and indicates how to eliminate them. The operator secures best efficiency by keeping the *steam flow* and *air flow* pens together. The *flue gas temperature record*, when compared with these records, shows the condition of baffles and tubes.

Described in Bulletin No. 44.

Multi-Pointer Gage

This gage is made with any number of pointers and any scale combinations from one to twelve. The pointers have a 10-in. motion over plainly marked, illuminated



scales so that readings can be taken at a distance of 20 ft.

The form is so convenient and easily read that it has been developed to show draft, pressure, temperature, rate of flow, stoker speed, and other factors, thus indicating in one instrument all the secondary operating conditions.

Fully described in Bulletin No. 162.

Boiler Water Level Recorder

This provides a record of actual water level throughout the full range of the boiler drum to check the operation of feed water regulators, to guide manual control, and to prevent or determine the cause of boiler failures. This recorder may be combined with a feed water meter to record both factors on one chart.

Remote indicators and records, operating from the main recorder can be placed at other points if desired.

Full details in Bulletin No. 112.

Coal Meter

A sturdy, accurate meter for measurement of coal or other granular material in gravity chutes from overhead bunkers. The total amount is shown on a large illuminated counter which can be read easily at a distance of 50 ft.

Write for Bulletin No. 221.



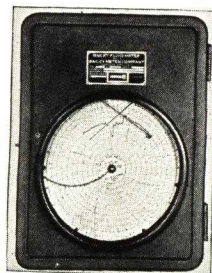
Bailey Coal Meter

Fluid Meter

Records and integrates flow of steam, gas, water and other liquids at any pressure. Records of pressure and temperature can be incorporated to record on same chart with flow if desired.

Described in Bulletin No. 300.

Electrically operated fluid meters can also be supplied when it is desirable to place the instruments at a considerable distance from the pipe line.



Bailey Fluid Meter

Recorders

Bailey Recorders are available in numerous types containing as many as four pens to record any combination of pressures or temperatures on a 12-in. uniformly graduated chart.

Long Distance Indicators

Bailey Meter Selsyn Operated equipment for recording and indicating pressure, temperature, draft, liquid level and other factors at practically any distance from the source is extremely accurate and reliable.

Indicators in large and small sizes, one pen or two pen recorders with 12-in. charts, combination indicating and recording instruments are standard equipment.

Several receiving instruments may be operated from the same transmitting element.

Write for Bulletin No. 110.

Bailey Meter Control

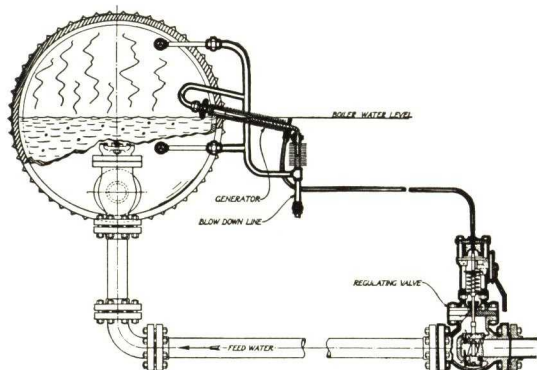
Bailey Meter Control automatically regulates the supply of fuel and air to steam boilers to handle the variations in load. It controls the supply of fuel and air simultaneously, in accordance with the demand for steam, and continuously readjusts the air to maintain the proper proportion of air to fuel as well as the desired furnace draft for best efficiency. It operates the boiler so as to automatically maintain test results in every-day operation.

Immediate response in controlling Feed Water Flow to parallel changes in Steam Flow is secured with the Bailey Three-element Feed Water Control. Operating from Steam Flow, Feed Water Flow, and Boiler Water Level, the control maintains the boiler feed always at the rate best suited to existing condition, thus assuring safe and smooth performance of boilers and turbines.

Described in bulletins Nos. 181 and 182.

Feed Water Regulator

The thoroughly reliable Bailey Thermo-Hydraulic Feed Water Regulator delivers effective regulation at



Diagrammatic Installation of Feed Water Regulator

all ratings. Because of its fully-balanced valve, it quickly and easily meets changes in load.

Low installation cost, removable valve parts, and independence of valve location are other distinctive features.

Completely described in Bulletin No. 82.

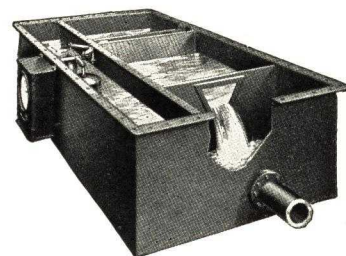
Meter Panel

Panel boards are made up of steel plate in proper sizes to give a symmetrical and uniform appearance.

They are made of one piece of sheet steel, the sides for supporting the board and the edges being bent back leaving slightly rounded corners.

Weir Meter

A V-notch weir offers many advantages for the measurement of water and certain other liquids at or near atmospheric pressure. The flow curve is such that greater accuracy is obtained over a wider range than with any other type of meter.



Bailey Weir Meter

The meter integrates the total flow in pounds, gallons or cubic feet and records the rate of flow on a 12-in. circular chart, upon which the temperature may be simultaneously recorded.

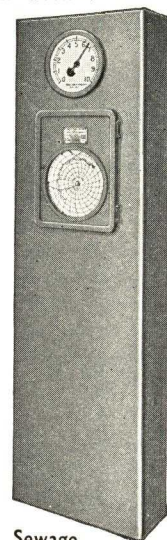
Bulletin No. 61 describes this meter in detail.

Sewage Meter

The Bailey Sewage Meter accurately measures the flow of sewage, sludge, dirty water or other liquids, using a Venturi tube, flow nozzle or orifice as the differential producing device.

This meter is of the open float type with differential gearing and cam designed so that the register operates in direct proportion to the rate of flow. The instruments indicate, integrate and record the flow; charts being 12 in. in diameter and uniformly graduated. Instruments are furnished on a self-supporting panel or unmounted for grouping in a meter gallery.

A complete line of Bailey Meters for sewage treatment and water supply is described in Bulletin No. 39.



Sewage Meter

Tubing and Compression Fittings

Extra heavy copper tubing, $\frac{1}{2}$ in. outside diameter, and compression fittings are ideal as connecting lines to fluid meters, boiler meters, and draft gages. This material is also excellent for small service lines under pressures as high as 800 lbs. per sq. in.

The tubing and fittings are quickly and easily installed, are leakproof, and are not subject to loosening from vibrational strains.

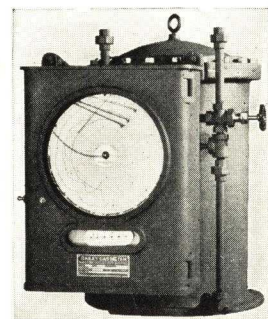
Details in Bulletin No. 13.

Gas Meter

This meter records, and may also totalize the rate of flow of gases under pressures varying from less than atmospheric to 300 lb. per sq. in. The chart is uniformly graduated, 12 in. in diameter with direct reading scales.

Pressure compensator, pressure or temperature recorders, may be applied if desired.

Described in Bulletin No. 35.



Bailey Gas Meter

BUILDERS IRON FOUNDRY

9 Coddling Street, PROVIDENCE, R. I.

BRANCH OFFICES

NEW YORK, N. Y., 20 Vesey Street

PHILADELPHIA, PA., N. E. Cor. 36th and Walnut Streets
PITTSBURGH, PA., 1403 Oliver Building

CHICAGO, ILL., 866 Peoples Gas Building

REPRESENTATIVES

ATLANTA, GA., Wm. F. Wilcox, First National Bank Building
BUFFALO, N. Y., Empire Equipment Co., 310 McKinley Avenue
CHARLOTTE, N. C., Grinnell Co., Inc., P. O. Box 336
CLEVELAND, OHIO, H. F. Bauer, Power Auxiliary Co., 2013 Prospect Street
DALLAS, TEX., Morey & Morey, 417 Praetorian Building
DENVER, COLO., Ambler & Riter, 2122 E. 13th Avenue
DETROIT, MICH., Poe Company, 729 Seward Avenue
KANSAS CITY, MO., Forslund Pump & Machine Co., 3031 Main Street
LOS ANGELES, CAL., Percy Keatinge, 612 Black Building
MINNEAPOLIS, MINN., Edward Johnson, 257 Fourth Avenue, South
TORONTO, ONT., CAN., Drummond, McCall & Co., Ltd., 373 Front Street East

ST. LOUIS, MO., Power Equipment, 4903 Delmar Boulevard
SALT LAKE CITY, UTAH, Ambler & Riter, Kearns Building
SAN FRANCISCO, CAL., Percy Keatinge, 8 Monadnock Building
SEATTLE, WASH., Shibley Co., Inc., 7th Floor Textile Tower
MONTREAL, QUE., CAN., Drummond McCall & Co., Ltd., 930 Wellington Street
VANCOUVER, B. C., CAN., Chas. A. Moorhead, 1402 Bekins Building
BUENOS AIRES, ARGENTINA, Krelinger & Van Peborgh Ltda, 380 Cangallo-Casilla 44
MEXICO, D. F., MEXICO, John H. Yeaman Co., Avenida Madero No. 70

Products of the Meter Department

VENTURI and ORIFICE METERS for liquids, gases, steam, etc.

BUILDERS "ORIFLO" ORIFICE FLANGES.

CHRONOFLO ELECTRIC FLUID METER for fluid flow, water levels, valve positions, pressures, supervisory control, telemetering.

SHUNT METERS for steam, air and gas.

Also Venturi Rate of Flow Controllers; Venturi Chemical Feed Regulators; Loss of Head Gauges; Water Level Recorders; Barometric Type Mercury Manometers for testing work; Effluent Controllers and Gauges for filtration plants, etc.; Automatic Chemical Reagent Proportioners.

Venturi Meter Tube

The year 1887 was noteworthy in hydraulic engineering because it marked the invention of the Venturi Meter Tube by Clemens Herschel. Shortly afterward the first Venturi Meter Register for use with the Herschel Tube was perfected by the engineers of BUILDERS IRON FOUNDRY and the complete Venturi Meter made available for the measurement of flow in main pipe lines. Today the use of the Venturi is world wide, not only for water but for nearly all fluids, whether gaseous or liquid.

The Venturi Meter Tube is placed in pipe line in the same manner as ordinary pipe. From the inlet to the throat the interior diameter gradually decreases and then gradually increases again to full diameter at outlet.

The unrestricted passageway thus formed results in



"Venturi"—Registered

high differential pressure between inlet and throat with minimum friction loss. Annular pressure chambers are provided at inlet and throat. Throat is bronze lined.

Connection to the indicating, recording or registering instrument is simply made by two small pipes, one from the inlet and one from the throat chamber.

Type M Register-Indicator-Recorder

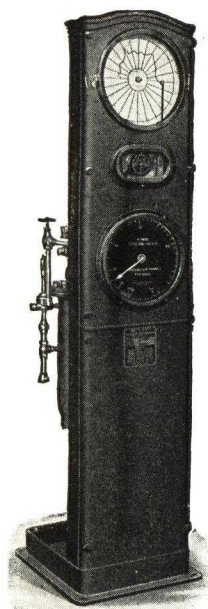
This machine has the characteristics of unusual ruggedness and extreme accuracy.

The Type M furnishes three distinct kinds of information: it shows on 10-in. circular indicator dial the momentary rate of flow through the Venturi Meter Tube; permanently records this rate upon a large circular chart; gives total quantity on a circular counter dial.

Each register is graduated for the particular Venturi Meter Tube with which it is to be used.

The Type M measures cold water, hot water, oil and other liquids, high pressure gases, steam,

etc.; it is universally employed for all main water supply lines, boiler feed, hot water heating systems, and many other important kinds of service.



Type M Register-Indicator-Recorder
Base, 18 in. x 20 in.
Height, 6 ft.



Type Y Register-Indicator-Recorder
Base, 15 in. x 16 in.
Height, 4 ft. 6 in.

Type Y Register-Indicator-Recorder

A somewhat smaller Register than the Type M, but suitable for the same kinds of service.

Can be used in connection with Venturi Tubes, Nozzles and Orifices.

Indicator dial 8½ in. long; charts 10-in. diameter.

Interior mechanical parts of corrosion-resisting materials; exterior neatly finished. Adapted for panel mounting.

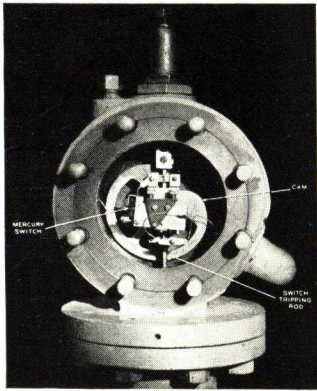


Herschel Standard Venturi Meter Tube

*PARTIAL LIST OF STANDARD VENTURI METER TUBES AND CORRESPONDING MEASURING RANGES FOR WATER

Diameter of pipe, in.	Catalogue No.	Length of meter tube, ft. in.		Pounds per hour		Gallons per minute	
		ft.	in.	Minimum	Maximum	Minimum	Maximum
2	21	1	7	3470	45100	7	90
3	31½	2	4½	7820	102000	16	205
4	42	3	6	13900	181000	28	360
5	52½	4	2	21700	282000	44	565
6	63	4	10	31300	406000	63	810
12	126	8	10	125000	1626000	250	3250
24	2412	16	10			1000	13000
36	3618	24	10			2250	29300
48	4824	32	10			4000	52000

*Intermediate and larger sizes of Venturi Meter Tubes are omitted from this table. See Bulletin 260 for complete list.



Mercury Transmitter with Cover Removed

Chronoflo Electric Fluid Meter

"From hundreds of feet to hundreds of miles"

Attracting wide attention and approval, the Chronoflo has introduced entirely new features to the field of metering. Four approved units are employed: the telechron motor; the mercury switch; the magnetic relay; the magnetic clutch. Electric impulses of variable time intervals, proportional to rates or positions are transmitted by the primary mercury unit to the receiver elements which are motor driven. Extremely small mercury movements are detected and recorded with certainty throughout a wide range from zero to maximum.

Regular a-c. current is used and variations in voltage do not affect performance.

Suitable for intramural or distant transmission of quantities, rates, levels, pressures, temperatures and other values. Can operate continuously over regular telephone channels for long distance.

tance without interruption to conversation. Comprehensive illustrated bulletins available.

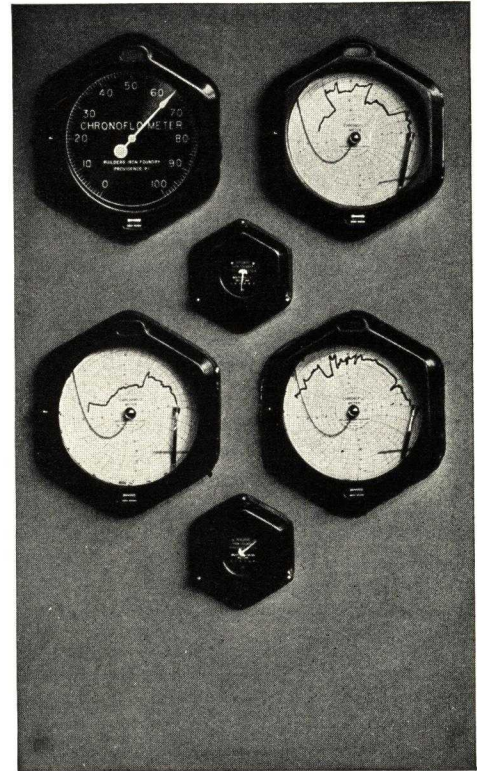
Illustration at Right:

The Powerful Chronoflo Brings Remarkable Information Over Telephone Circuit to a Central Exhibit Panel at New York Power Show

An Unprecedented Demonstration of Long Distance Metering

The Water Supply to Manhattan—Three upper dials continuously indicating, recording, and totalizing the entire flow through a 17-ft. diameter meter, one of the three largest municipal meters in the world, all in Catskill Aqueduct.

Steam Generated by a Huge New York Edison Boiler—Lower left dial continuously recording the steaming rate and totalizing pounds of steam from a 25,000 hp. boiler, one of the three largest ever built, all located in the East River Station of the New York Edison Co.

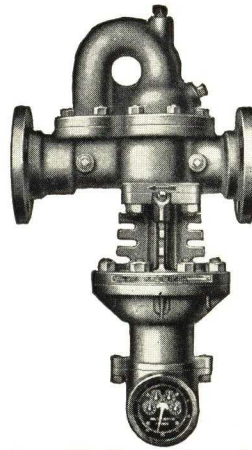


Shunt Meter, Type KS, for Steam, Air or Gas

This meter fills the need for a low priced, practical, *mechanical* meter which is easily installed and accurate over a wide range. It is especially well suited for use in checking the distribution of steam or air to various buildings, departments, machines or processes. District heating companies, hotels and office buildings are basing their charges for steam sold to customers, restaurants, laundries and other tenants, on the flow recorded by Shunt Meters.

The accompanying illustration shows the complete meter. Installation consists simply of bolting the flanges to companion flanges in the line. No connecting piping or electrical connections are required.

As the flow enters the meter and comes in contact with a chord orifice a differential is created. This produces a flow through nozzles into the shunt line causing a small turbine rotor mounted on a vertical shaft to revolve. (There are no moving parts in the main line of flow.) The turbine shaft extends through a housing into a condensation chamber below the main line. A damping fan attached to this shaft operates under



Type KS Shunt Meter for Steam, Air or Gas
(12-in. face to face flanges, 2-in. size)

water, keeping the speed low and eliminating bearing trouble. Magnetic drive between this chamber and counter mechanism protects the latter from moisture.

Each meter is calibrated for a definite operating range and working pressure, but a correction factor chart is furnished so allowance can be made for pressure variation. If the operating conditions should change, the meter can usually be adapted to the new conditions at a comparatively small cost.

The Shunt Meter is installed as a unit in 2, 3, and 4-in. lines. For larger size mains a small meter is installed in a by-pass line around an orifice in the main line.

The table below gives the capacity of the low pressure and standard meters at various steam pressures.

Extra heavy meters can be furnished for pressures up to 300 lb. and temperatures not to exceed 600° F.

More complete information about the Shunt Meter is given in Bulletin No. 255, which will be sent upon request.

RATED CAPACITY, POUNDS PER HOUR, OF TYPE KS SHUNT METER
(Steam Meters, Saturated Steam)

WITH SMALLEST ORIFICE				WITH LARGEST ORIFICE			
Gauge pressure, lbs.	2-in. Meter No. 2A	3-in. Meter No. 3A	4-in. Meter No. 4A	Gauge pressure, lbs.	2-in. Meter No. 2E	3-in. Meter No. 3E	4-in. Meter No. 4E
Low Pressure Meters				Low Pressure Meters			
0	200	220	850	0	600	1400	2500
10	300	370	1410	10	1000	2400	4200
30	420	530	1970	30	1650	3400	5800
50	500	630	2360	50	2000	4000	7000
Standard Meters				Standard Meters			
100	520	810	5300	100	4200	9500	16500
150	620	970	6400	150	5000	11000	20000
200	700	1100	7200	200	5700	13000	23000

Minimum capacity, one-tenth rated capacity. Temporary overload capacity, 50% above rated capacity. Many other intermediate capacities available. Also Bypass Shunt Meter assemblies for pipe lines up to 12 in. diameter.

MOREY & JONES, LTD.

MANUFACTURING ENGINEERS

Power Plant and Mechanical Specialties
922-A South Hemlock Street, LOS ANGELES, CAL.

AKRON, OHIO, Summit Industrial Instrument Co.
BUFFALO, N. Y., Atlas Equipment Co.
CHICAGO, ILL., Bell & Gossett Co. and A. F. Barron
CINCINNATI, OHIO, H. Q. Porter
CLEVELAND, OHIO, Tomlinson-MacLachlan, Inc.
DALLAS, TEX., Briggs-Weaver Machinery Co.

DETROIT, MICH., DuBois Company, Inc.
EAST CLEVELAND, OHIO, Harry M. Nobis
GREENVILLE, S. C., J. W. Vaughan, Jr.
KANSAS CITY, MO., Combustion Equipment Company
MERIDEN, CONN., John S. Isdale

NEW YORK, N. Y., Eastern Steam Specialty Co., Inc.
OKLAHOMA CITY, OKLA., Eugene F. Saltsman
PHILADELPHIA, PA., Brogan & Company
PITTSBURGH, PA., Atlas Equipment Co.
SAN FRANCISCO, CALIF., Robt. L. Johnson

MONTREAL, QUE., CANADA, Mechanical Equipment Co., Ltd.
WINNIPEG, MAN., CANADA, W. W. Hicks & Co.
BUENOS AIRES, ARGENTINA, Leopoldo Sol & Cia.

ANTWERP, BELGIUM, E. V. Anderson
LONDON, ENGLAND, Metalloys, Limited
BUCHAREST, ROUMANIA, Edwin A. Clarence

Products

INDICATING FLOW METERS, Dial and Mercury-column Types, for all types of fluid flow, Flash Boilers and Flanging Machines.

MANOMETERS and LIQUID LEVEL INDICATORS and GAUGES.

RECORDING, INTEGRATING, and INDICATING FLOW METERS.

AUTOMATIC COMBUSTION and DAMPER CONTROLS for oil, gas, coal-stoker and powdered coal fired industrial and heating boilers.

MJL Flow Indicators

Indicate rate-of-flow of water, air, steam, gases, oils, gasolines, syrups, chemicals under wide range of conditions in oil refineries, chemical plants, flour mills, central station power plants, industrial plants, etc.

Mercury Type (Patented)—
Principle—Standard U-tube and orifice, long used as most reliable means of flow measurement in pipes.

Styles and Sizes—Built in two styles: "close-hookup," mounting directly onto orifice body in pipe line; and "remote," where "indicator" is mounted at distance, on wall or panel. "Indicator" proper built in 6, 12, and 18-in. scale lengths, both styles, all commercial pressures.

Orifice Flanges and Orifices—Sizes to 6-in. "close-hookup" style; ½ to 12-in. inclusive "remote" style. Larger pipe sizes to order.

Distinctive Features—Direct-reading scales, calibrated in any unit, as gals. per min. or hr., cu. ft. per hr., lbs. per min., bbls. per hr. or day, etc., with large easily-read figures on scale. Accurately calibrated for specific conditions.

"Non-Blow-Over" feature prevents loss of mercury due to sudden surge or over-capacity flow. By-Pass Valve built into unit allows equalization of pressure in two "legs," making it possible to check zero position of indicating fluid under pressure. No separate by-pass fittings needed.

In both styles, orifices quickly removable for replacement for new conditions. Either style Indicator can be disconnected from flow line under full pressure.

Dial Type (Pats. Pend.)

—A bellows-operated, mechanical type Indicator, with extra large dial, using no mercury. Has direct-reading scale, calibrated in any desired units. Outside zero adjustment; simple range adjustment and positive overload protection features. Applicable to same flow services as above. Used with all sizes of MJL Orifices and Orifice



Dial Type Indicator

Flanges. Also employed as a liquid level Indicator. Furnished for all working pressures to 250 lbs. per sq. in.

MJL Liquid Level Indicators

The MJL No. 29 Level Indicator is designed as a distant-reading instrument, suitable for accurately showing liquid levels in storage tanks. Where employed with below-ground tanks, operation is on the hydrostatic principle, using an air bell located inside the tank. Standard tubing is used to connect this bell with the Indicator or Gauge. Note that MJL No. 22 Dial Type Indicator may also be employed as a level Gauge for showing amounts of liquid stored in above-ground tanks.



High-Pressure Manometers

MJL Hi-Pressure Manometer indicates differential pressures on either high or low pressure lines. Is a two-glass instrument regularly furnished for working pressures upwards of 2500 lbs. per sq. in. Has mercury check.

Especially applicable for use on water filters and softeners where rate of normal and "back-wash" flow are both required to show on the same instrument.



Manometer

MJL Combustion Control Regulators (Pats. Pend.)

Pilot-operated, sensitive, powerful Regulators, automatically controlling both fires and draft on steam boilers, in perfect synchronism, as load demand varies.

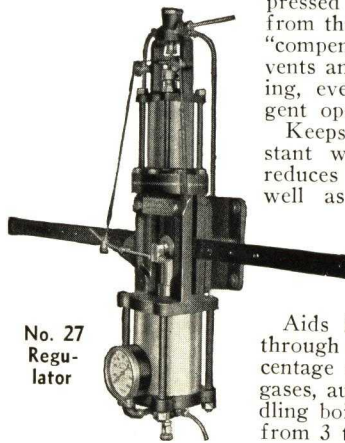
MJL No. 27 Regulator—A powerful, sturdy cylinder-operated Regulator, capable of a full 12-in. stroke on end of arm, with full adjustability to conform to varying movements required of dampers, louvres, gas or oil valves, stoker engine valves, forced draft fan controls, etc. Has large diameter cylinder powered

either with water or compressed air, or steam direct from the boiler itself. Special "compensating" feature prevents any overtravel or hunting, even under most stringent operating conditions.

Keeps steam pressure constant within narrow range; reduces fuel consumption as well as labor attendance on firing.

Reduces upkeep costs involved in furnace and setting repairs, since sudden heating up and cooling down are avoided.

Aids in increasing boiler efficiency, through helping to maintain high percentage of CO₂ and low CO in stack gases, automatically. Suitable for handling boilers steaming under pressures from 3 to 450 lbs. gauge.



No. 27 Regulator

Gas Control Valves

Special, gradual-opening type, for any pipe size. In screwed style up to 1½ in., incl.; flanged in larger sizes.

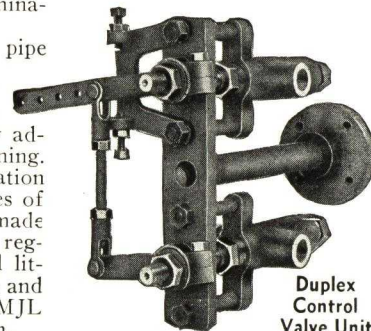
When ordering, if possible state pressure available at valve, allowable drop in pressure through valve, and maximum hourly flow.

Duplex Control Valve Unit

Designed particularly for regulation of oil and steam to steam-atomizing oil-burners. Maintains constant ratio of steam to oil at all loads. Simple to adjust; once set, remains constant, resulting in maximum burner efficiency with smoke elimination.

Built in ½ and ¾-in. pipe sizes.

Control valve usable where a given "travel" is required, and still be fully adjustable for maximum opening. Recommended for oil regulation on air and mechanical types of burners. Air adjustment made by suitable connection to regulator. Complete technical literature, and data on prices and delivery available on all MJL equipment upon application.



Duplex Control Valve Unit



Indicator Body

SIMPLEX VALVE AND METER COMPANY

Power Plant, Water Works and Sewage Specialties

2019 South 68th Street, PHILADELPHIA, PA.

LIST OF SIMPLEX REPRESENTATIVES

ATLANTA, GA., W. D. Taulman, 548 Hurt Building
BOSTON, MASS., Geo. W. Stetson, Jr., 89 Broad St.
CHICAGO, ILL., A. F. Barron, 59 E. Van Buren St.
CLEVELAND, OHIO, Tomlinson MacLachlan Co., Inc., 1603 St. Clair Ave.
DENVER, COLO., E. C. Brisbane, 301 Flat Iron Bldg.
DETROIT, MICH., DuBois, Inc., 2832 E. Grand Blvd.
HOUSTON, TEX., M. N. Dannenbaum Company, 304 Shell Building
KANSAS CITY, MO., O. G. Smith, 4610 Troost Ave.
LOS ANGELES, CALIF., Water Works Supply Company, 2326 E. 8th St.
LOUISVILLE, KY., R. N. Overstreet, 1455 South Fourth St.
MILWAUKEE, WIS., F. H. Dorner, 1107 E. Knapp St.

TORONTO, ONT., CANADA, Simplex Valve and Meter Company of Canada, Ltd.

MINNEAPOLIS, MINN., Kent Ervin Eng. Co., 732 Builders Exchange Bldg.
NEW ORLEANS, LA., A. C. Hays, 627 Toulouse St.
NEW YORK, N. Y., W. K. Sowdon, 342 Madison Ave.
OMAHA, NEB., O. F. Barklage and Co., Keen Hotel Bldg.
PITTSBURGH, PA., W. L. Vansant, Farmers Bank Bldg.
RICHMOND, VA., Starke Foundry & Mfg. Co., 1520 E. Cary St.
ROCHESTER, N. Y., A. L. Covill, 1041 Granite Bldg.
SALT LAKE CITY, UTAH, Water Works Eqp. Co., 149 W. Second South St.
SAN FRANCISCO, CALIF., Water Works Supply Company, 501 Howard St.
SEATTLE, WASH., Woodworth Anderson, 4 Marion St. Dock
WASHINGTON, D. C., Glegge Thomas, 1006 Loan & Trust Bldg.

Products

SIMPLEX HOT and COLD WATER METERS;
VENTURI TUBES;

PITOT TUBES and MANOMETERS.

Also Rate of Flow Controllers; Loss of Head and Rate of Flow Gauges; Portable Pitot Tube Chart Recorders; Water Level Gauges; Automatic Air Release Valves; Air and Vacuum Valves.

Simplex Meter Registers

Simplex meter registers are operated by venturi tubes as illustrated, and, where necessary, are operated by pitot tubes, orifices or any means wherein the difference in hydraulic pressure varies in a fixed relation to rate of flow.

Simplex meter registers are used for measuring hot and cold liquids under all pressure conditions—for measuring boiler feed, condensate, circulating water, water supply, sewage, brine solutions, anhydrous ammonia, etc.

The indicating rate of flow dial has uniformly spaced graduations for equal changes in rate.

The chart is rectangular in form and arranged for daily removal or longer periods.

The totalizer is actuated by practically frictionless means and consequently registers accurately.

CAPACITIES OF VENTURI TUBES AND
SIMPLEX METER REGISTERS

Dia. pipe, in.	Catalog No. for ordering	Hot water (200° F.), pounds per hour		Cold water, gallons per day	
		Max- imum	Min- imum	Max- imum	Min- imum
2	2x 2 1/2	18,150	900	.....	.....
	2x 2 1/4	24,700	1,250	.....	.....
	2x 1 1/2	30,000	1,500	.....	.....
	2x 1 1/8	40,000	2,000	.....	.....
3	3x 1 1/2	29,600	1,480	.....	.....
	3x 1 1/4	46,500	2,300	.....	.....
	3x 1 1/8	68,000	3,400	.....	.....
4	4x 1 1/2	69,500	3,500	.....	.....
	4x 1 1/4	92,000	4,600	.....	.....
	4x 1 1/8	122,000	6,100	356,000	18,000
5	5x 1 1/2	90,000	4,550	265,000	13,300
	5x 1 1/4	120,000	6,000	348,000	17,500
	5x 1 1/8	190,000	9,500	555,000	28,800
6	6x 1 1/2	187,000	9,350	547,000	27,400
	6x 1 1/4	228,000	11,400	665,000	33,500
	6x 1 1/8	274,000	13,700	800,000	40,000
8	8x 1 1/2	268,000	13,500	780,000	39,000
	8x 1 1/4	340,000	17,000	1,000,000	50,000
	8x 1 1/8	485,000	24,500	1,420,000	71,000
10	10x 1 1/2	.....	.....	1,400,000	70,000
	10x 1 1/4	.....	.....	2,220,000	111,000
	10x 1 1/8	.....	.....	3,320,000	166,000
12	12x 1 1/2	.....	.....	2,200,000	110,000
	12x 1 1/4	.....	.....	3,200,000	160,000
	12x 1 1/8	.....	.....	4,480,000	224,000
14	14x 1 1/2	.....	.....	3,170,000	160,000
	14x 1 1/4	.....	.....	4,360,000	220,000
16	16x 1 1/2	.....	.....	4,300,000	216,000
	16x 1 1/4	.....	.....	5,680,000	285,000
	16x 1 1/8	.....	.....	8,300,000	415,000
18	18x 1 1/2	.....	.....	7,200,000	360,000
	18x 1 1/4	.....	.....	9,000,000	450,000
20	20x 1 1/2	.....	.....	8,900,000	445,000
	20x 1 1/4	.....	.....	13,300,000	666,000
	20x 1 1/8	.....	.....	16,000,000	800,000

This is a partial list. Specific needs can be filled from the many other sizes available.



Simplex Hot Water Meter

The Simplex hot water meter provides an indication of the rate of discharge, a chart record of the variation in rate and a totalization of the flow.

Used for feed water supplied to boilers, condensate water, circulating water and hot water used in the industries.

Furnished for wall mounting, pedestal or switchboard panel. Dial and chart graduations are in pounds per hour and in boiler horsepower for 200 or 70° F. Totalizer shows pounds, but other flow units may be employed.

At Right:

Simplex Hot Water Meter for Wall Mounting



Simplex Cold Water Meter

The Simplex cold water meter has useful application wherever cold water is to be measured.

It may be employed with the venturi tube in any size main and under any pressure.

In addition to totalizing the flow, it indicates the rate of discharge and records the variation in rate.

Its arrangement and appearance are similar to that of the hot water meter described above.



Simplex Cold Water Meter

For stock instruments, flow dial shows gallons per day; chart shows gallons per 24 hours and the totalizer shows gallons

Simplex Manometer

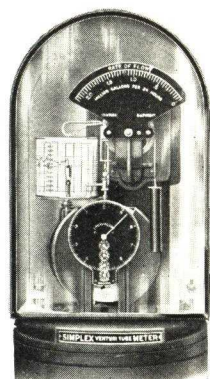
The Simplex manometer indicates rate of discharge by means of the scale, the graduations of which are compared with the height of the mercury column in a single gauge glass.

Mercury always in sight—it can not be driven from instrument and lost. Scales may be rotated around gauge glass so as to be read at any convenient location.

It may be arranged for wall bracket or floor stand.



Simplex Manometer



Simplex Venturi Tube
Meter Register

With each instrument is supplied mercury, tools, one year's supply of charts, spare pens, ink, printed instructions, bulletin and water manometer testing appliance by which the instrument may be set exactly correct and at any time thereafter the correctness of its adjustment may be verified

REPUBLIC FLOW METERS CO.

Originators and Pioneers of the Electrical Flow Meter
2252 Diversey Parkway, CHICAGO, ILL.

ATLANTA
BOSTON
CHICAGO

CINCINNATI
CLEVELAND
DALLAS
DENVER

DETROIT
GARY
INDIANAPOLIS

BRANCH OFFICES

KANSAS CITY
LOS ANGELES
MINNEAPOLIS

NEW YORK
PHILADELPHIA
PITTSBURGH
ST. LOUIS

SALT LAKE CITY
SAN FRANCISCO
SEATTLE

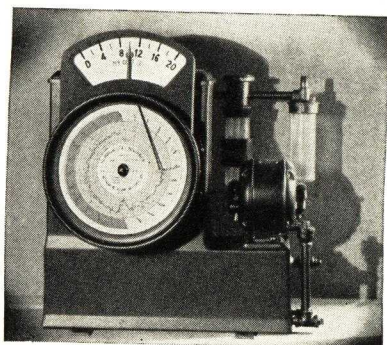
DOMINION FLOW METERS CO., Toronto and Montreal, Canada
ELECTROFLO METERS CO., Park Royal, London N. W. 10, England

Products

FLOW METERS for Steam, Water, Gas, Air and Oil; BOILER METER PANELS; CO₂ RECORDERS and INDICATORS; DRAFT GAGES; LIQUID LEVEL GAGES; PRESSURE GAGES; RECORDING THERMOMETERS; MANOMETERS; ORIFICES; PITOT TUBES; PYROMETERS, INDICATING, RECORDING and CONTROLLING.

CO₂ Meters

The Republic Motor-driven CO₂ Meter is available with either mechanical indicator and recorder, or with detached electrically operated reading instruments. It registers a continuous penline record of percent CO₂ in flue gas, measured by the accurate and dependable Orsat method (volumetric absorption). Due to the fact that the Republic CO₂ Meter does not operate by water power, poor water conditions at points of installation need no consideration whatever. This instrument has been designed with a view to good appearance and visibility of record, as well as accuracy and ruggedness.

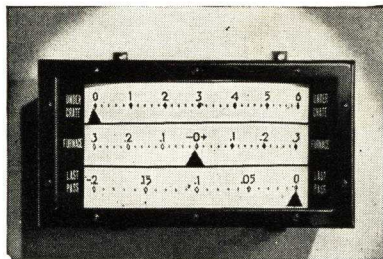


Republic Indicating and Recording CO₂ Meter

If desired, two additional records can be placed on the same ten inch circular chart. These records may be any combination of draft, temperature, or flow measurement.

Draft Gages

Republic Draft Gages are actuated by an extremely simple diaphragm or bellows type mechanism, directly connected to a 10-inch pointer arm which travels horizontally across a 14-inch illuminated scale. The scale with its large index figures, uniform graduations and internal illumination, can be easily read from a distance of fifty feet. The Republic Multiple Draft Gage is made up of a series of separate indicating units, and can be supplied in any combination and number of units desired. The entire instrument is housed in a dust-proof, compact, neat appearing case for either projected or flush mounting.



Republic Multiple Draft Gage



Flowmeters

Republic Flow Meters are supplied for measuring the flow of steam, water, gas, air or oil. The reading instruments are electrically operated, which permits their being placed any distance from the point of flow

measurement desired. These meters have proved themselves well adapted for long, accurate service in all types of industrial plants.

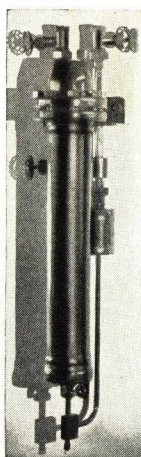
The reading instruments, indicator, recorder, and integrator are supplied separately, or in any combination desired. Each instrument is mounted on a 12-gage steel panel, 16 inches wide, and ranging in height from 16 to 32 inches, depending upon the instrument combination selected. Each actuating unit is individually housed and electrically shielded in a dust and moisture-proof metal container. The entire unit can be easily removed from the back of the panel for inspection.

In the majority of installations, the integrator readings are the most important of the three readings. For this reason the Republic integrator has been made the primary instrument, operating absolutely independent of the indicator or recorder. Its accuracy is not dependent on or effected by any clock mechanism or mechanical action. The cyclometer type dial is easily read, and a special test dial is provided which permits accurate readings to be taken over a short period.

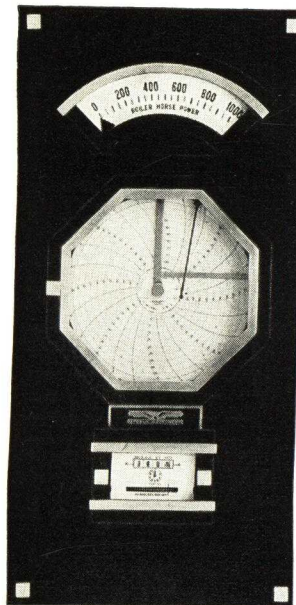
Separate indicators with a large 24-inch dial are also available for boiler front mounting.

The orifice plate is the standard differential medium used, although other types can be employed. The use of the thin plate orifice means low cost of installation. It can be inserted between any available flange where there is a reasonable amount of straight pipe.

The meter body, or mercury "U" tube, consists simply of the housing, the scale, or resistance element, and mercury. As the mercury rises or falls in the "U" tube, due to changes in flow, it cuts in or out a definite amount of resistance, varying the current flowing through the reading instruments in direct proportion to the flow in the pipe. The mercury is covered with oil which keeps the contact rods clean, and forms an oil seal, preventing foreign matter from entering the measuring chamber. Republic meters are designed for all ranges of differential pressures, and are available for the measurement of flow under pressures up to 5000 lbs. per sq. in.



Meter Body

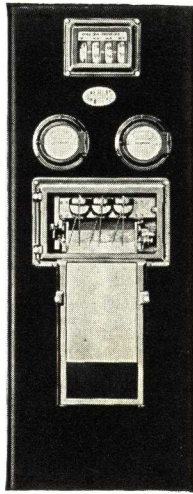


Indicator Recorder and Integrator

Boiler Meter Panels

Republic Boiler Meter Panels are built to your specification with any combination of meter records desired. An outstanding feature is the Republic Multiple Strip Chart Recorder which records every essential boiler operation on one wide strip chart so that each record is separate and distinct, without the confusion of interwoven lines. A combination of any six records may be had on one chart regardless of whether they are records of temperature, CO₂ percentage, steam flow, or water flow.

The boiler panel shown at the right has a multiple draft indicator, and the two integrating instruments necessary for the calculation and logging of results mounted along with the multiple strip chart recorder so that this panel affords a complete survey of boiler operation.



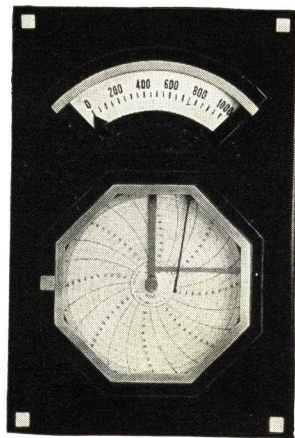
Boiler Meter Panel

Master Panels

Republic Master Panels, like the boiler meter panels, are built to your specification, with any combination of meter records desired. In plants having a number of large steam consuming units or departments, the Republic Master Panel offers many advantages. All records as to the amount of steam, water, gas, etc., consumed by each unit or department can be centralized on one panel conveniently located for the party in charge of the distribution of these services. The superintendent or power dispatcher can tell at a glance how each department is operating throughout the entire plant.

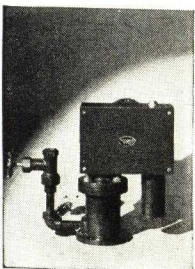
Liquid Level Gages

The Republic Liquid Level and Pressure Gage is of the electrical type, employing the Republic system of remote registration which permits the reading instruments to be located any distance from the place where the pressure or level record is taken. The reading instruments can be either indicating or recording, or both (as shown on panel). If desired, a large clock type indicator with a 24-inch dial can also be provided.



Level Indicator and Recorder

It is the function of this



Gage Body

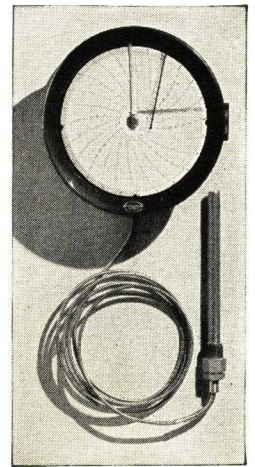
gage to measure static pressures, the pressure head, or height of liquids in pipes, tanks, standpipes, reservoirs, tank levels in chemical plants; blast furnace pressures and numerous other applications.

The gage body or actuating medium consists of a metal bellows which receives the head or pressure. The travel of the bellows positions a wiper arm moving across a rheostat

regulating the resistance in the instrument circuit so the instruments indicate and/or record the varying head or pressure. This gage can be easily adapted to a signal system or the automatic control of pumps or other equipment.

Thermometers

Republic Distance Recording Thermometers are of the gas expansion type. They have an operating range from minus 40° F. to 1000° F., and will accurately record temperature changes at any distance up to 200 ft. from the point where the temperature is being measured. The Republic Thermometer features the cartridge sealed helix which permits the helical element to be easily removed from the recorder for inspection, without any possibility of damage. It also eliminates the necessity for returning the entire instrument to the factory whenever the element is to be tested or recalibrated.



Recording Thermometer

Plain bulbs, or bulbs with union or screw connections, are available to suit any kind of application.

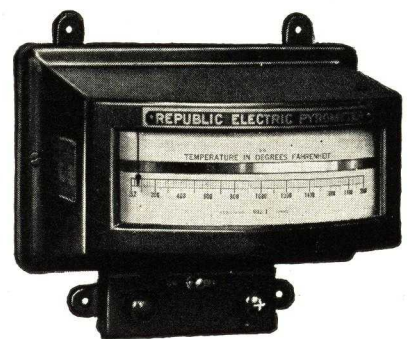
Multiple pen records can also be furnished to record separate temperatures on one chart. The Republic thermometer gives accurate readings across the entire chart, which has evenly divided degree divisions.

Pyrometers

The Republic Pyrometer has the highest resistance of any double pivoted pyrometer, which makes possible a maximum accuracy; therefore variation in length of lead, changes in temperature along the connecting wires or poor contact resulting from carelessness or oxidation will have little effect upon the accuracy of the readings of Republic Pyrometers.

The resistance averages 20 ohms per millivolt. The coil is exceptionally light in weight and mounted with double pivoted genuine sapphire jeweled bearings which result in the practical elimination of frictional errors. The pivots are especially designed so that damage from shock is highly improbable.

The case is all aluminum and is dust, moisture, and fume proof.



Indicating Pyrometer

Control Pyrometers

The Republic Control Pyrometers are identical in size and appearance with the regular Indicating Pyrometer illustrated above. The complete control mechanism is mounted within the standard case, making each instrument entirely self-contained. All contacts are opened and closed in a vacuum tube mercury switch, independent of pointer and moving parts.

AMERICAN SCHAEFFER & BUDENBERG DIVISION

CONSOLIDATED ASHCROFT HANCOCK COMPANY
INCORPORATED

BRIDGEPORT, CONN.

CONSOLIDATED SAFETY VALVE DIVISION
ASHCROFT AMERICAN GAUGE DIVISION

HANCOCK VALVE DIVISION
HANCOCK AND METROPOLITAN INJECTOR DIVISION

The Controlograph

The Controlograph is used in all process industries where the close control of temperatures or pressures is important. It combines in one instrument controlling and recording movements, both operated by the same thermostatic system.

The control movement acts as a pilot to control the opening and closing of a diaphragm motor valve on the main supply or discharge line, while the recording element draws a graphic record of the temperature being controlled.

The construction of the Controlograph is such that the recording element may pass and repass the control point without reducing the accuracy of the temperature record.

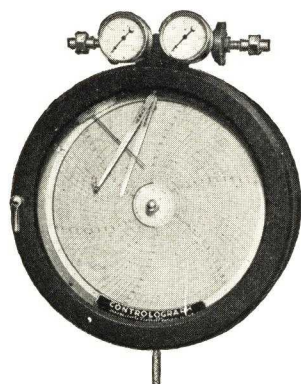
An air economizer is built in as a standard part of the Controlograph. Hence, the compressed air consumption is reduced to a minimum.

Adjustment is provided to change the Controlograph from off and on to throttling action at the will of the operator.

Operating temperatures can be from minus 40° to plus 1000° F. or equivalent C. Mercury or vapor actuated thermostatic systems are available.

The diaphragm motor valves used with these controllers may be any size required from $\frac{3}{8}$ in. up.

Non-recording temperature or pressure controllers are also available. These are made with ranges practically the same as the Controlograph.



Remoto Instruments

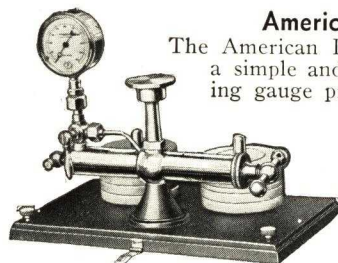
American Pressure and Temperature instruments of the dial or recording types are available for long distance transmission.

Used extensively for indicating or recording water levels in roof tanks or in reservoirs a considerable distance from the point of reading.

American Gauge Testers

The American Dead Weight Gauge Tester is a simple and compact instrument for testing gauge pressures up to 1000 lb. Made of brass, nickel-plated, on a cast iron base and furnished with die cast weights. All necessary tools are supplied in a carrying case.

Write for Catalogue D-37.

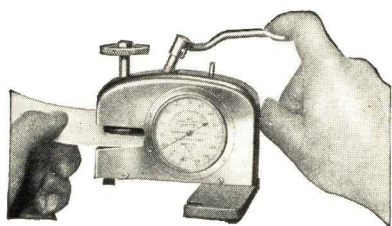


Ashcroft Paper Tester

It is simple to operate. The paper is merely inserted in the clamp and secured by turning the knurled disc to the right. The handle is then turned to the right which increases the pressure on the paper within the clamp. As the handle is turned, this pressure is indicated on the dial until the breaking point of the paper has been reached. Then the hand remains stationary and the bursting strength in pounds per square inch is read on the dial.

Made with two graduations; namely 0 to 20 lb. for testing tissue and other very light paper, and from 0 to 140 lb. for all other classes of paper.

Write for Catalogue.



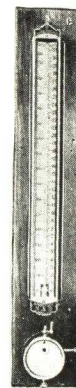
American Mercury Column Vacuum Gauge

An accurate instrument of improved and superior workmanship. Beautifully finished; the usual piping from Catchall (condensation trap) to gauge is at the back of the panel. Catchall is so designed that all connections may be made either front or back. Case is made of high grade sheet steel, light and very strong, finished in black instrument enamel. Glass front is set in black enameled frame.

"V" shaped scale silvered finish with prominent black enameled figures and graduations. Scale graduated 0-31 in. mercury vacuum on one side and 0-780 millimeters on the other.

Micrometer zero adjustment. Raises or lowers mercury container by means of thumb-nut to correct for change of level. Connections to Catchall fitted with $\frac{1}{4}$ in. union coupling. Fitted with drain cock for removing accumulated moisture and air cock for relieving air to allow draining of moisture.

Write for Catalogue 1350.

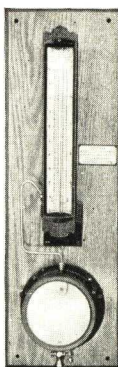


American Absolute Pressure Gauges

This instrument measures the actual absolute pressure in an apparatus under vacuum. While mercury column vacuum gauges serve the same purpose, varying barometric pressures affect its reading. With this instrument the indications are independent of the barometric pressure. Correct absolute pressures are read directly without calculations.

The gauge is shipped filled with mercury. Made in a black enameled "V" shaped case with a 12 in. silvered scale with black engraved 0 to 10 in. graduations on one side in 0 to 5 lb. on the other side, in $\frac{1}{16}$ in. and $\frac{1}{16}$ lb. subdivisions.

Write for Catalogue B-37.



American Mercurial Barometer

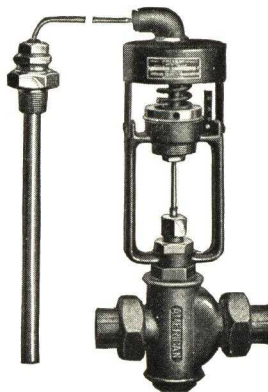
The scale is graduated from 26 to 31 in. of mercury in $\frac{1}{16}$ in. on one side and the corresponding millimeters on the other.

This scale is "V" shaped with silvered finish and with prominent black engraved lines and figures. An accurate indicating thermometer is attached to the scale.

It is built into the same case as the Mercury Column Vacuum Gauge which is of pressed steel, finished in dull black enamel.

Furnished with or without oak panel, or if desired, it may be supplied mounted with the Type 1366 Vacuum Gauge on a single panel.

Write for Catalogue 1350.



American Precision Temperature Controllers

American Precision Temperature Controllers are self-operated and simple in construction. For regulating temperatures from 0° to 470° F. and equivalent C.

Under favorable conditions temperature will be held within 1°.

Sensitive, rugged and accurate. For hot water service tanks, water heaters, etc.

Standard ranges carried in stock. Size of valve must be specified.

Write for Catalogue R-37.



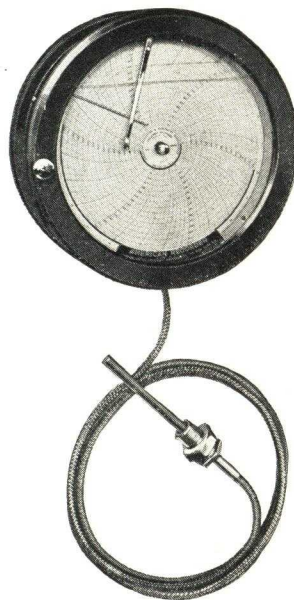
American Recording Thermometers

American Recording Thermometers give a graphic record of changes in temperature within a range of minus 40° to plus 1000° F. or equivalent C. The standard chart is 10 in. in diameter, with an effective recording distance of 3½ in. A large number of charts with different ranges are available.

This instrument is made in a die cast black enameled moisture proof case, with a suspended pen arm of monel metal. The standard length of connecting tubing is 10 ft. and lines can be furnished up to 200 ft.

Any American Recorder can be furnished with a Telechron electric movement instead of the usual spring wound clock, if desired. The electric movement insures maximum accuracy of time, perfectly synchronized records and elimination of winding, oiling, regulating and cleaning.

Write for Catalogue H-37.



American Dial Thermometers

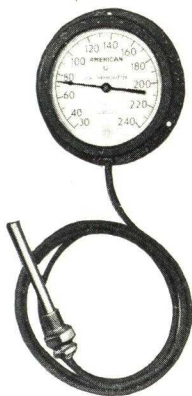
American Dial Thermometers in black die cast case and ring, with 6 and 12-in. dial for all temperatures from minus 40° to 1000° F. and equivalent C.

For indicating temperatures some distance away from the point of application.

Standard length connecting tubing is 10 ft. and may be furnished up to 200 ft. As easy to read as a gauge. Accuracy guaranteed. A very convenient thermometer for every industrial purpose.

Can be shipped direct from stock in standard ranges.

Write for Catalogue G-37.

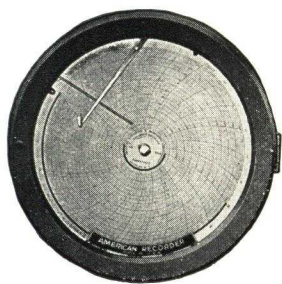


American Recording Gauges

American Recording Gauges give a graphic record of pressures or vacuum. The pressures may be as low as 2 in. of water and as high as 10,000 lb. The American Recording Gauge is the result of over 75 years' experience in the manufacture of fine instruments.

The pressures to be recorded may be air, gas, water, oil, ammonia or any other liquid which is not corrosive to bronze or steel. The standard chart is 10 in. in diameter, with an effective recording distance of 3½ in. A large number of charts for all pressures are available.

American Recorders are furnished either back or bottom connection for wall mounting, in a special flush mounted case for gauge board installations.



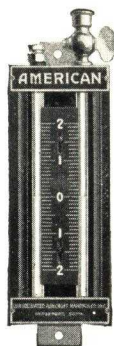
Type 1370 "U" Gauge

For accurately measuring pressures or vacuum in inches of water or mercury. The scales are graduated in inches and subdivided in tenths so that .1 in. is easily read.

These gauges can be used for taking readings of differential pressures or drafts by connecting both legs of the "U" tube.

Made in 4, 6, 8, 10, 12, 18, 24, 30 and 36 in. scales.

Write for Catalogue 1350.



American Glass Thermometers

American Glass Thermometers are made in a brass "V" shaped case, all black enameled. A plate glass front protects the scale, and the front is removable to clean the glass, when necessary.

Any temperature range from minus 60° to plus 1000° F. or equivalent C., can be supplied. The scale is hand calibrated to its respective tube. It is finished in dull black with prominent white figures and subdividing lines engraved on both sides of the scale.

The glass thermometer tubes are thoroughly annealed and seasoned, and the tube is highly magnified to secure maximum reading convenience. All glass thermometer tubes are gas filled to prevent separation of the mercury column, and they are fitted with an expansion chamber at the extreme top of the tube to minimize chance of damage, in case the thermometer is subjected to temperatures higher than the scale reading.

Red back magnifying glass tubes can be supplied, if desired.

American Glass Thermometers are made with monel metal bulb chambers to assure maximum strength, protection from corrosion and elimination of binding of the bulb chamber in the socket.

There are a large number of different styles consisting of various stem lengths, inclined and reclined cases, with handle tops and with special extension necks.

Write for Catalogue F-37.



Type 203
Angle
Stem



Type 222
with
Handle
Top



Type 201
Straight
Stem



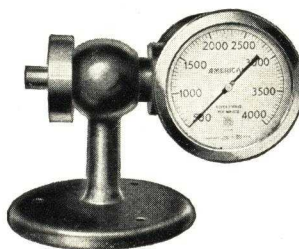
Type 293
Test Thermometer
with Armor
12 In. Long

American Indicating Tachometers

American Indicating Tachometers for indicating speeds directly in revolutions per minute. Dial sizes are 6, 8½ and 10 in. Used principally for belt drive from pulleys.

Also hand tachometers, as well as recording and combination indicating and recording types. May be calibrated to read in feet per minute or any unit of speed measurement.

Write for Catalogue J-37.



Stationary Tachometer



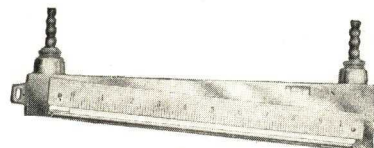
Hand Tachometer

Type 1384 Differential Draft Gauge

Inexpensive but thoroughly reliable. For indicating draft and extremely low pressures. Made with closed front to protect glass parts against breakage and collection of dust. Body is of polished aluminum, black enameled. Scales are accurately calibrated and spirit level is carefully fitted.

Equipped with bracket and micrometer adjustment.

Write for Catalogue 1350.



ASHCROFT AMERICAN GAUGE DIVISION

CONSOLIDATED ASHCROFT HANCOCK COMPANY
INCORPORATED

BRIDGEPORT, CONN.

AMERICAN SCHAEFFER & BUDENBERG DIVISION
HANCOCK AND METROPOLITAN INJECTOR DIVISION

CONSOLIDATED SAFETY VALVE DIVISION
HANCOCK VALVE DIVISION

DURAGAUGES

Unconditionally guaranteed for five years. Made with an indestructible movement of nitralloy steel, possessing the hardest known surface of any substance except the diamond. This movement is specially designed for use on severe operating services which destroy ordinary gauges in a short time. It operates as smoothly as though it had jeweled bearings. The bourdon tube is bored out of solid, special alloy steel, heat treated for extreme strength, with threaded connections and metal to metal joints at the socket and tip for all pressures above 100 lb. The socket is of drop forged steel.

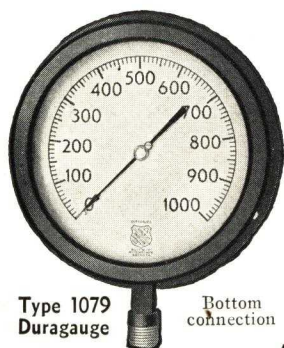
Three types of cases: for wall mounting; for flush mounting; and for flush mounting with illuminated dial.

No. 1077, dial sizes 4½, 6, 8½, 10, 12, 16 in. Black finished iron case. Chromium plated ring. No. 1076, dial sizes 8½, 10, 12, 16 in. Black finished iron case. Chromium plated ring.

No. 1079, 4½ to 16-in. faces. Black finished case. Chromium plated ring. Also polished brass case and chromium plated all over.

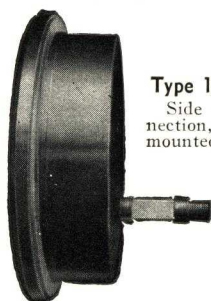
All pressures up to 10,000 lb. with accuracy guaranteed to ½ of 1% throughout the full scale range.

Write for Catalogue T-37.

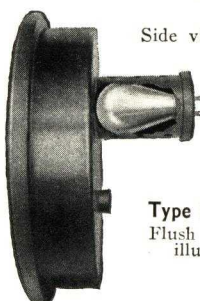


Type 1079
Duragauge

Bottom
connection

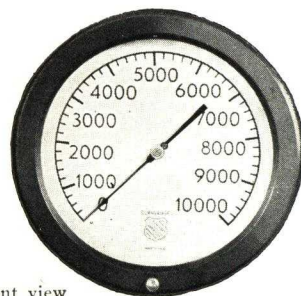


Type 1077 Duragauge
Side view, back connection, showing flush mounted case



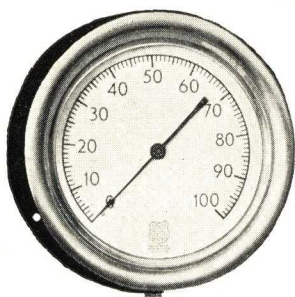
Side view

Type 1076 Duragauge
Flush mounted, with illuminated dial



Front view

ASHCROFT AMERICAN QUALITY GAUGES AND GAUGE BOARDS



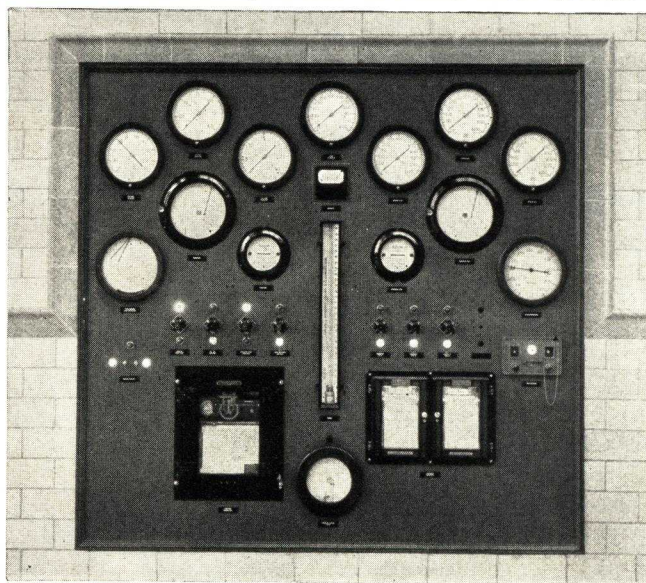
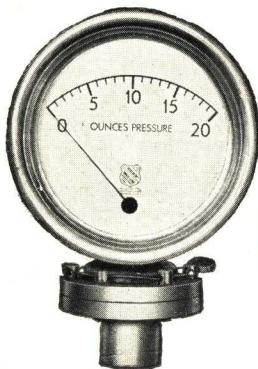
Type 1010 Pressure Gauge

Made in all sizes 3½ in. to 12 in. inclusive, for steam, water, air, oil, etc. Range, 15 to 1000 lb.

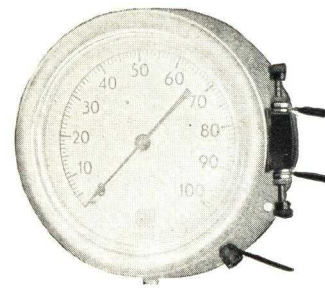
Below:

Type 1022 Low Pressure Gauge

An extremely sensitive and accurate low pressure gauge of the diaphragm type, for pressures as low as 8 oz.



Typical Ashcroft American Gauge Board in a Central Station
Showing indicating gauges, recording gauges, dial thermometers, recording thermometers and mercury column



Type 1064 Electric Contact Gauge

For ringing alarms or lighting warning lights. Any dial gauge 5 in. or larger can be equipped with this alarm device

Below:

Type 1072 Chemical Gauge

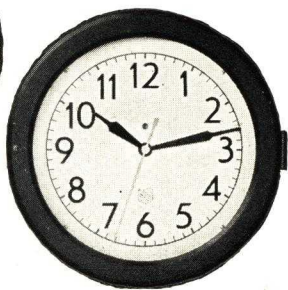
For any chemical which would corrode a bronze or steel bourdon tube. Showing removable bottom part



Engine Room Clocks

At left, Engine Room Clock in 10-in. Recorder Case for matching instruments on gauge board. With Telechron electric movement.

At right, 8-day clock, made in all sizes, with Seth Thomas, Howard or Chelsea movement



THE BROWN INSTRUMENT COMPANY

4497 Wayne Avenue, PHILADELPHIA, PA.

CABLE ADDRESS, "Brownson," Philadelphia

BRANCH OFFICES

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PHILADELPHIA, PA.
PITTSBURGH, PA.
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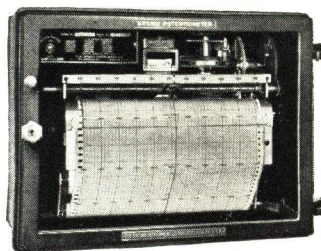
Distributors in Most Foreign Countries

Potentiometer Pyrometers

For indicating, recording and controlling temperatures up to 3000° F. Operate on the potentiometer principle. The e.m.f. of thermocouple is balanced automatically against a known potential. Movement of suspension type galvanometer directs mechanism driven by synchronous motor.

Models—Indicators, Recorders producing from one to six records on 12-in. chart. Automatic control or signalling.

Features—40-in. slide wire, humidity compensator, combines ruggedness with extreme accuracy. Over 50 features—Catalog 1101.

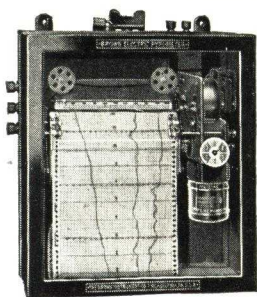


Millivoltmeter Pyrometers

For indicating, recording and controlling temperatures up to 3000° F. Operate on the millivoltmeter principle. The e.m.f. of thermocouple causes galvanometer to deflect and read temperatures directly.

Models—Indicators, recorders producing from one to twelve records on 7-in. chart. Automatic control or signalling.

Features—Automatic cold junction compensator, no dry cells, other features described in Catalog 15B.



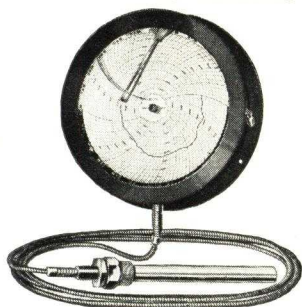
Thermometers

For indicating, recording and controlling temperatures up to 800° F.

Principle—Opening or closure of a tubular helix by expansion or contraction of a liquid, vapor or gas induced by temperature changes.

Models—Indicators, recorders, 8 or 12-in. circular chart; 1, 2, or 3-pens; strip chart recorders, single or duplex record; automatic control or signalling.

Features—Include fifteen constructional features. For details see Thermometer Catalog 6701.



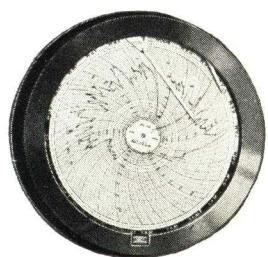
Electric Flow Meters

For indicating, recording and controlling flow of steam, air, oil, gas and other fluids. Operate on inductance bridge principle. U-tube, modified by six different range tubes for varying one leg of the U to meet the different flow ranges; together with adaptation of the electrical, inductance bridge for transmission of motion from the manometer float to the instrument.

Manometers—Range for differential pressures from 0.217 in. of water to 16 in. of mercury, working pressures up to 5000 lbs.

Models—Indicators, recorders, 12-in. circular chart, with or without integrator and planimeter;

Strip chart recorders producing one or two records. Automatic control or signalling.



Features—Distant operation, 6 range changes, automatic planimeter, accuracy unaffected by voltage changes. Other features explained in Catalog 2002.

Mechanical Flow Meters

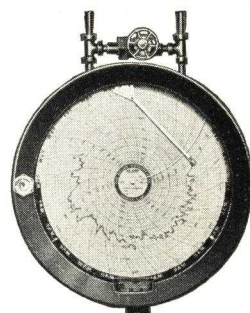
For indicating, recording flow of steam, air, oil, gas and other fluids where electricity is not available.

Principle—U-tube, modified by six different range tubes for varying leg of the U to meet different flow ranges together with linkages for direct connection between float and meter mechanism.

Manometer—Ranges for working pressures up to 1000 lbs. to measure differential pressures up to 16 ins. of mercury.

Models—Indicators, recorders, 12-in. circular chart, with or without integrator and planimeter. With pressure or temperature pens or both, automatic compensation for pressure or temperature.

Features—6-range changes, square root or evenly divided chart, automatic planimeter, large float. For full information see Catalog 2201.



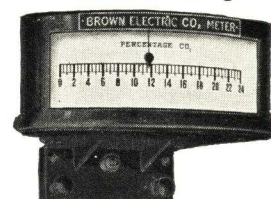
CO₂ Meters

For indicating and recording % CO₂ content in mixed gases.

Principle—Relative thermal conductivity of CO₂ to air.

Models—Indicators, recorders, producing one to six records on 7-in. chart; duplex recorder records per cent CO₂ and temperature of flue gas.

Features—Write for Catalog 3004.



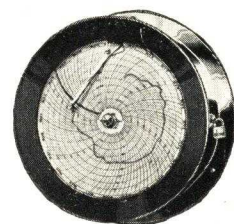
Pressure and Vacuum Gauges

For indicating, recording and controlling pressure ranging from a few inches of water up to 5000 lb., or vacuum up to 30 in. of mercury.

Principle—Opening or closure of a tubular helix by pressure. In case of low pressures a diaphragm is used in place of helix.

Models—Indicators, recorders, 8-in. or 12-in. circular chart; 1, 2 or 3-pens; strip chart recorders, single or duplex record; automatic control or signalling.

Features—For details see Brown Gauge Catalog 6701.



Automatic Controls

Brown instruments are supplied for automatically controlling temperatures, pressures, flows and liquid levels. Instruments indicate or record while they control. Write for Catalogue 8008.



Other Brown Instruments

Resistance Thermometers (Catalogue 93); Liquid Level Gauges; Flame Analyzer; Remote Type Instruments (Catalogue 7501).

Catalogs

Special Brown Catalogs are available describing the various Brown Instruments and will be promptly sent on request.

THE BRISTOL COMPANY

Pioneers in Process Control Since 1889

WATERBURY, CONNECTICUT

AKRON, OHIO, 572 So. High Street
BIRMINGHAM, ALA., Comer Building
BOSTON, MASS., Consolidated Building
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DETROIT, MICH., Book Building
LOS ANGELES, CALIF., 747 Warehouse Street
NEW YORK, N. Y., 220 East 42nd Street
PHILADELPHIA, PA., Market St. Nat'l Bank Bldg.

PITTSBURGH, PA., Koppers Building
ST. LOUIS, MO., Boatmen's Bank Building
SAN FRANCISCO, CAL., Rialto Building
TORONTO, ONT., CAN.

Bristol Products

Automatic Process Controllers; Automatic Cycle Controllers; Automatic Pressure, Vacuum, Temperature, Liquid Level and Flow Controllers; Automatic Controllers, Electrically Operated; Automatic Controllers, Air Operated; Automatic Free Vane Recorder Controller; Pressure Gauges, Recording, Indicating; Absolute Pressure Gauge, Recording; Vacuum Gauges, Recording, Indicating; Thermometers: Class 1 (Liquid or Bimetallic), Class 2 (Vapor Filled), Class 3 (Gas Filled), Recording,

TRADE-MARK
BRISTOL'S
REG. U. S. PAT. OFFICE

Indicating; Pyrometers, Recording, Indicating; Voltmeters, Recording; Ammeters, Recording; Wattmeters, Recording; Frequency Meters, Recording; Tachometers, Recording, Indicating; Mechanical Motion Recorders; Electrical Operation Recorders; Time Totalizers; Engine Counters; Revolution Counters; Psychrometers, Recording; Liquid Level Gauges, Recording, Indicating; Electric Motor Operated Valves for Process Control; Diaphragm Motor Operated Valves for Process Control.

Bristol's Recording and Indicating Pressure and Vacuum Gauges



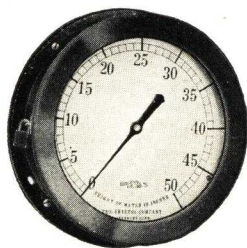
Recording Gauge
Dust, fume and moisture proof. Model 40M

For securing continuous day and night records of pressure or vacuum for steam, air, gas and liquids. Bristol's Recording Gauges are furnished with charts to read in pounds, ounces, inches, feet, metric, or any desired units, for ranges from full vacuum to 12,000 lb. per sq. in.

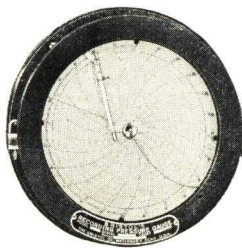
Indicating gauge furnished in round form case with 10 or 8-in. size dial.

Also furnished in case suitable for wall mounting or in flush type for use on panelboard.

The case is of moisture-proof and dust-proof construction.



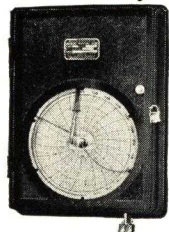
Indicating Gauge
Model 41



Recording Gauge
Round form—Model 41

Bristol's Recording Wet and Dry Bulb Thermometers or Psychrometers

An accurate and dependable instrument by which relative humidity or atmospheric moisture may be determined. Recording Psychrometers are available in both self-contained and distance types.



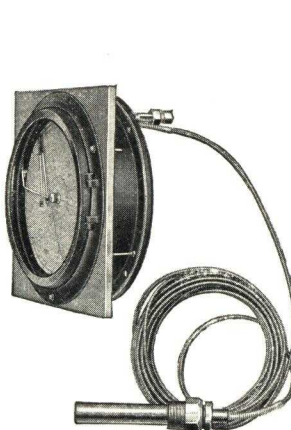
Absolute Pressure Recorder
Model 35

Bristol's Direct Reading Absolute Pressure Recorder

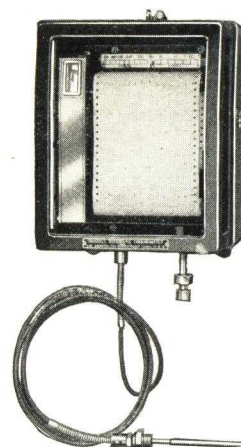
Bristol's Direct Reading Recording Absolute Pressure Gauge gives an accurate continuous 24 hour record of absolute pressure, automatically compensated for barometer and other climatic fluctuations.

Furnished for ranges as low as from 0 to 50 millimeters of mercury column absolute.

Bristol's Recording Thermometers



Recording Thermometer
Flush Type in combination with Pressure. Model 343



Recording Thermometer
Strip Chart in combination with Pressure. Model 225.

For all commercial ranges of temperature from -60° to $+1000^{\circ}$ F., Bristol's Recording Thermometers can be furnished. Plain sensitive-bulbs are supplied for use in ovens, kilns, etc., or bulb with union and screw connection for temperatures in closed spaces under pressure, such as boiler feed water, superheated steam, milk pasteurizers, etc.

Instruments available in self-contained types for recording temperatures on location or distance type permitting the sensitive-bulb to be located several feet from the instrument.

Bristol's Recording Electrical Instruments

Bristol's Recording Voltmeters for all commercial ranges of direct and alternating current. It is important to maintain uniform voltage for operating electric lights and for many other purposes. Records obtained with Bristol's Voltmeters show whether desired results are secured.

Bristol's Recording Millivoltmeters, equipped with high grade pivot jewel-bearing movements, are extensively used for recording very minute potentials which are involved in electrolysis investigations.

Bristol's Recording Ammeters, furnished in switchboard or portable type, provide continuous records of current on generator and feeder panels, for motor and transformer tests and to provide records of customers' current consumption.

Bristol's Strip Recording Wattmeter, portable model, designed for use on both polyphase and single phase alternating

current. Convenient and practical for carrying about to locations where it is desired to obtain records of consumption of electrical energy.

A recent development is the Triplex Recording Instrument, available in both ammeters and voltmeters. The unique overlapping chart arrangement makes it possible to reduce the overall size so that the complete instrument case is $17 \times 10 \frac{1}{2} \times 5$ in., yet the active portion of each chart is plainly visible at all times.

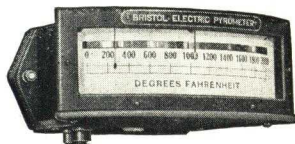
The single unit small size rectangular form of recording instrument is admirably adapted to panelboard mounting where space is limited. This instrument uses a 6-in. chart.

Bristol's Indicating and Recording Electric Pyrometers

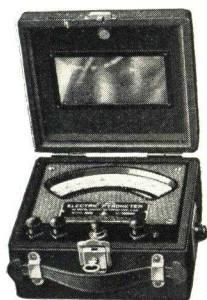
These pyrometers may be installed at distance from the furnace—it is only necessary to run the duplex leads between thermo-couple and instrument.

The high resistance Model 420 illustrated is especially suited for use with furnace for hardening high speed steel, brick and pottery kilns, and other types of furnaces. It has a long, wide open scale which makes it easy to read.

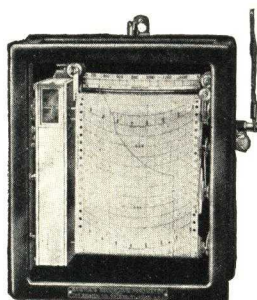
The portable instrument is particularly suitable for general checking in shop and laboratory.



Indicating Pyrometer
High resistance Model 420

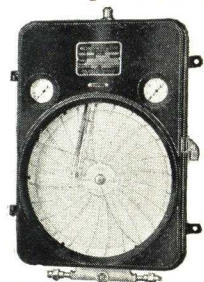


Portable Indicating Pyrometer
Model 322

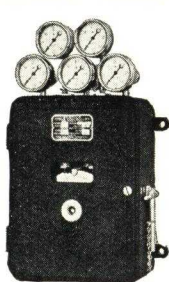


Recording Pyrometer
Strip Chart Model 425

Air Operated Bristol's Controller Equipment



Free Vane Temperature Recorder Controller
Model 5240M



Cycle Controller
Model 6335



Diaphragm Motor Operated Controller Valve

Employing a unique principle of operation, Bristol's Air Operated Free Vane Recorder Controller makes possible temperature regulation to a degree heretofore unobtainable.

Controller action is full floating. Under the influence of temperature fluctuations the ingenious Free Vane device utilized for effecting control actually floats from one position to another. It does no mechanical work. It experiences no resistance or friction. Temperature indications are accurate. There is no distortion, either at, above, or below the control temperature.

The Free Vane Recorder Controller gives precisely the control which the temperature record indicates.

Bristol's Air-Operated Process Time Cycle Controller automatically regulates the mechanical operation in recurring process cycles on an exact time schedule. It provides precision time control of the several steps in any process cycle in which gov-

erning mechanisms can be made to respond in a definite sequence to diaphragm valves or other devices actuated by compressed air.

It is not a timer. On the contrary it does work or causes work to be done, in strict accord with the prescribed cycle schedule. The starting, stopping, and duration of every operation of the cycle is carried out on time all the time.

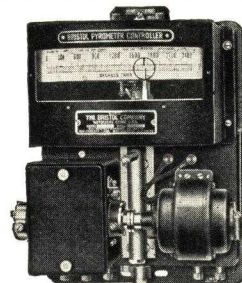
Electrically Operated Bristol's Controller Equipment



Motor Operated Controller Valve
BK type



Thermometer Controller, Model 177



Pyrometer Controller, Model 479

In this group are included the Thermometer Controllers, suitable for temperature ranges up to 1000° F., these instruments operating on the same principle as the several Bristol's Recording Thermometers. For higher temperature ranges up to 3000° F., Pyrometer Controller, operating on the thermoelectric principle, is offered. These instruments, used in connection with Bristol's Motor Operated Controller Valves, are adaptable for many kinds of control installations.

Bristol's Temperature Controllers

For over 40 years THE BRISTOL COMPANY has been designing and building instruments for automatically recording temperatures. More than 23 years ago the first thermometer control instruments were developed and installed. Now a complete line of Bristol's Automatic Control Instruments is available for temperatures up to 3000° F. for application to steam, oil, gas and electrically heated equipment.

The development of Bristol's Control Equipment has not been confined to one operating principle, but instead, to meet the varying requirements, both electric operated and air operated controllers are offered.

As manufacturers of a most complete line of controlling and recording instruments THE BRISTOL COMPANY is in most cases capable of furnishing complete equipment for industrial control installations, thus concentrating the entire responsibility for operation. The use of automatic temperature control equipment suited to the work and properly installed will result in better quality and uniform product, increase in production, decrease in rejections a decrease in repairs on furnaces, no waste in fuel, etc.

Bristol's Recording Electric Tachometers

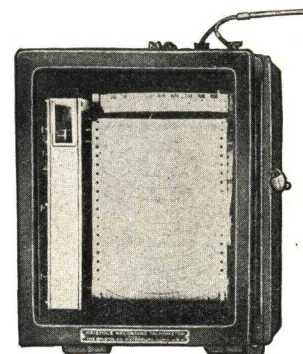
For recording the speed of shafting, machines, engines—in fact, the speed of any revolving piece of machinery.

Furnished in models using round carbon coated charts, strip charts, and indicating types.

Simple in construction and operation.



Recording Electric Tachometer
Round chart—
Model 1837



Recording Electric Tachometer
Strip chart—Model 1825

CROSBY STEAM GAGE & VALVE COMPANY

10 Roland Street, BOSTON, MASS.

BOSTON, MASS.

DISTRICT SALES OFFICES
CHICAGO, ILL. NEW YORK, N. Y.
SALES REPRESENTATIVES IN OTHER INDUSTRIAL CENTERS

LONDON, ENGLAND

Pop Safety Valve

For pressures to 2000 lb. and temperatures to 1000° F.

Outstanding Features of Design—(1) Nozzle throat, an exclusive feature, offers minimum resistance to discharge of fluid and insures maximum efficiency of flow through valve.

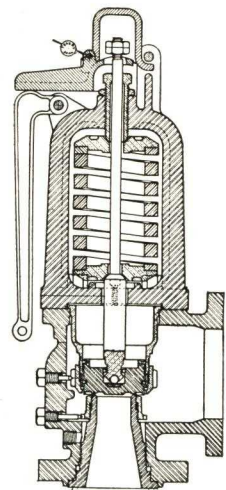
(2) Lift provides full opening and maximum nozzle capacity within allowed 3% accumulation.

(3) Operation gradual in its opening and closing, avoiding shock.

(4) Nozzle seat, and discs of special forged alloy steel, particularly resistant to erosion and corrosion.

(5) No guides to obstruct discharge through throat.

(6) Seat threads never under boiler pressure.



Style	Body	Size, in.	Max. press.	Max. temp.
HN-2	Steel	1½	600	800° F.
HN-2	Steel	3	600	800° F.
HN-3	Steel	3	900	800° F.
HN-5	Steel	1½	900	800° F.
HN-5	Steel	3	900	800° F.
HN-6	Steel	3	1500	800° F.
HN-7	Steel	3	2000	800° F.
HN-9	Steel	6	400	750° F.
HO-1	Iron	1½ to 4½	250	Sat. steam
		6	200	Sat. steam
HS-1	Steel	1½ to 4½	300	650° F.
		6	300	650° F.
HS-2	Steel	1½ to 4½	450	650° F.
HSA-1	Steel	1½ to 4½	300	750° F.
		6	300	750° F.
HSA-2	Steel	1½ to 4½	450	750° F.
HRI-B	Iron	2 to 4½	250	Sat. steam
HRI-C	Steel	2 to 4½	350	Sat. steam
HH	Bronze	½ to 1½	250	.....
		2 to 2½	250	.....

HR—A special low capacity design for return tubular boilers.

Note: Crosby Pop Safety Valves meet all requirements of A.S.M.E. code, State laws and Canadian registration.

Crosby Relief Valves

Crosby Relief Valves are extensively used for vapor or liquid on tanks, pumps, compressors, stills, natural gas, air, oil and gasoline lines. Different designs are made for various services. Standard valves in iron, steel or bronze for all pressures up to 16,000 lb. and for temperatures to 900° F. All models except JA and JH, which are made of bronze, have renewable seats; special metal for special service.



Fullway Valves

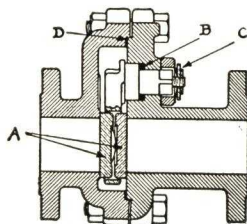
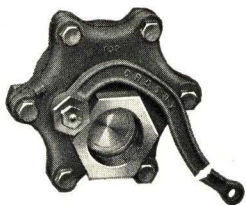
A valve of the swing gate type for boiler blow-off and general service.

Special Features—(1) Positive stop outside of valve which acts directly on lever.

(2) Two separate discs (AA) are held apart and in constant contact with their seats by a conical spiral spring. Each disc is free to find its own seat, being separate from and loosely held by the stirrup-like disc holder.

(3) "B" Solid ring packing and "C" adjustable tension spring, prevent leakage.

(4) Body is fitted together with male and female joint "D" insuring accurate alignment and preventing gasket from blowing out. Body is so designed that seats can be refinished in a lathe—discs also can easily be refaced.



(5) All parts are renewable and interchangeable, which means durability, low cost and convenience of repair.

Styles—For pressures up to 300 lb., screwed or flanged connections.

Simple or compound levers or a hand wheel can be supplied as an operating mechanism.

Sizes—1¼ to 3 in.

Indicating Gages

Both single and double tube types in all sizes and styles for both pressure and vacuum.

A New Design High Pressure Gage—Has lathe turned tubes attached to socket and tips by screwed joints—no solder used. Sizes 6 to 16 in. Pressures 100 to 1000 lb.



Special All-Steel Gages

This type gage has forged steel movement with case-hardened sector and pinion, forged steel socket and tip, steel tube. Designed for use on high temperatures and to indicate pressures with test gage accuracy.



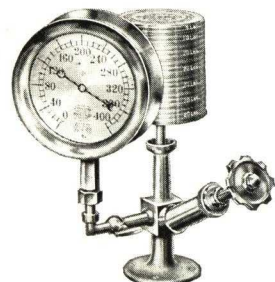
Recording Gages

For steam, gas, air, water, ammonia, etc. Iron or brass cases. Sizes 6¾, 8½, 10 and 12 in. Charts produced by special process insure against errors often occurring in printing of ordinary charts.

Special recorder for hydraulic presses.

Gage Tester

New design for pressures to 3000 lb. Reads in 1-lb. steps directly from figures on scale. Easy to operate and very accurate. Fluid pressure scales for testing gages to 25,000 lb.



Crosby Indicator

Style BC-101 for steam.

Style BC-201 for gas and Diesel.

Style BC-701 for ammonia.

Crosby reducing wheels for all styles.

Planimeters.

Dead Weight Tester

For testing gages to 1000 lb.

Crosby Globe, Angle and Check Valves

Crosby Improved Spring Seat Valves are excellent for services which require tight valves with minimum closing pressure. They are made in all sizes and of bronze, iron or steel as desired. Our special valve booklet will be sent on request.



Other Products

Also chime whistles, electrically and manually operated; whistle valves; gage boards.

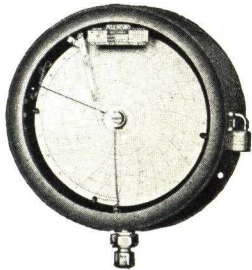
THE FOXBORO COMPANY

Controlling, Recording and Indicating—Flow, Pressure, Temperature, Liquid Level and Humidity

FOXBORO, MASS.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

Foxboro Indicating and Recording Gauges



Recording Gauge

For steam, gas, water, air, oil, ammonia, brine, or anything under vacuum or pressure. Both indicators and recorders are constructed for permanent accuracy.

Any range from full vacuum to 20,000 lbs. pressure.

Recorders may be furnished in multiple-pen or combination instruments.

Foxboro Indicating and Recording Liquid Level Gauges

For recording varying levels of rivers, reservoirs, canals, fore-bays, tail races, etc. Have been used widely for sewers, weir measurements, and oil storage tanks. Paper mills use them on Jordan Stuff Chests to get closer weights and more uniform products. Its operation is not affected by ice formation.

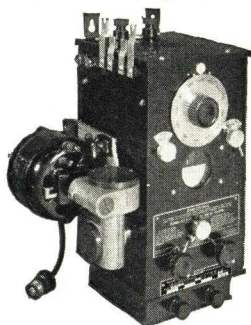


Liquid Level Gauge

Foxboro Indicating, Recording and Controlling Pyrometers

THE FOXBORO COMPANY manufactures a complete line of thermo-electric pyrometers of the potentiometer and direct deflection type.

The potentiometer pyrometer controllers automatically regulate oil, gas, electric or steam heat. Large deflection per degree of temperature change and knife-edge detection design, provides close, sensitive control. All controllers have safety-shut-off design which puts heat on minimum in case thermocouple circuit becomes open from any cause.



Potentiometer Control Pyrometer

Recording Potentiometer Pyrometers have charts 12 inches wide that are furnished for various chart speeds to meet requirements. Automatic cold junction compensation, integral construction of pen and slide-guide, and other features

wire contact, adjustable chart guide, and other features insure accurate records.

Portable, wall-type, direct-reading and indicating pyrometers can also be furnished.

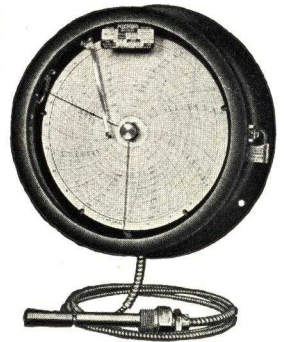
FOXBORO
INC. U.S. PAT. OFF.

Foxboro Indicating and Recording Thermometers

Indicating may be either long distance or stem type. Recording may be either long distance or self-contained type. Operation depends upon vaporization of a volatile liquid, or direct expansion of an inert gas.

Indicators give accurate temperature readings on a long, open, easily-read scale. Recorders make accurate records on 8, 10 or 12-inch charts.

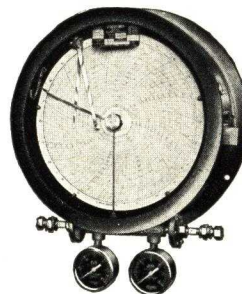
Multiple-pen recording thermometers can be furnished to record separate temperatures on one chart.



Recording Thermometer

Foxboro Automatic Recorder Controllers

For Temperature, Pressure, Humidity, Liquid Level and Flow



Recorder-Controller

Foxboro has a most complete line of air, gas or electrically operated controllers. These instruments are giving accurate, dependable, automatic control on all kinds of industrial processes.

Foxboro has the Instruments, the Engineers, and the Experience to solve any type of industrial instrument control problem. May we help you with yours?

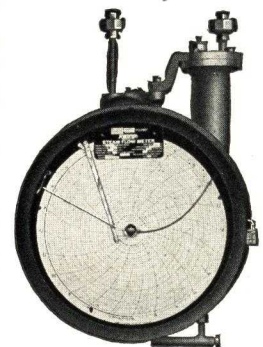
Foxboro Flow Meters

For Gas, Steam, Liquids and Other Fluids

Foxboro Flow Meters are designed to measure the flow of all fluids accurately. They are mechanical meters of the orifice type and are simple, rugged and dependable.

The calibration is built into the instrument at the factory and remains permanently accurate because of the meter's straight-line motion, freedom from over-range and loss of mercury, and freedom from the retarding action of dirt and scum.

All Foxboro Flow Meters can be furnished with an integrator which gives a reading of the total flow directly, without computation.



Steam Flow Meter

Instruments for Every Industrial Process—Write for Bulletins

JULIEN P. FRIEZ & SONS, INC.

A SUBSIDIARY OF THE BENDIX AVIATION CORPORATION

Manufacturers of Meteorological, Hydrometric and Air Conditioning Instruments

Baltimore Street and Central Avenue
BALTIMORE, MD.

Products

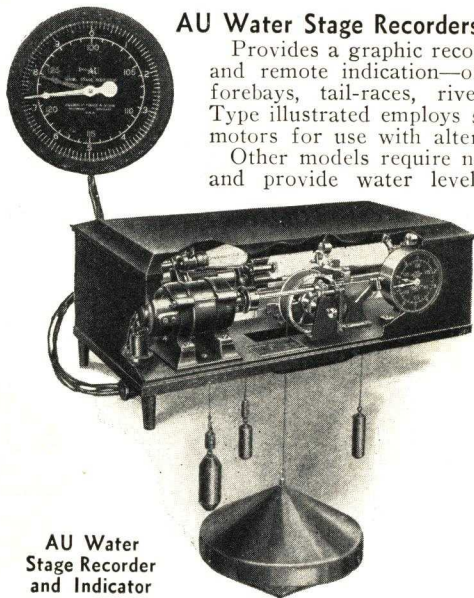
RECORDING and INDICATING BAROMETERS, HYGROMETERS, THERMOMETERS, RAIN GAGES and WIND INSTRUMENTS. LIQUID LEVEL INDICATORS and RECORDERS. HUMIDISTATS, HUMIDITY INDICATORS, PSYCHROMETERS, THERMOSTATS and HYGRO-THERMOGRAPHS.

Also Complete Control Assemblies for Air Conditioning Fields.

AU Water Stage Recorders and Indicators

Provides a graphic record at the source—and remote indication—of water levels in forebays, tail-races, rivers and streams. Type illustrated employs self-synchronizing motors for use with alternating current.

Other models require no electric current and provide water level records at the location of the recorder. These models are used extensively by the United States Government in its river flow investigations and by municipalities in the obtaining of data for flood control, water supply and sewage disposal studies.



AU Water Stage Recorder and Indicator

Humidistats, Humidity Indicators and Thermostats

Extremely sensitive, accurate and reliable Automatic Controls and Indicators for humidity and temperature for all classes of industrial and domestic Air Conditioning applications.

Incorporate specially prepared, multiple human hair elements.

Humidistats provided with setting pointer against dial accurately calibrated in percentages of relative humidity over range of 10% to 100%.

Approved by Underwriters' Laboratories, Inc.

Controls available in high or low voltage for two or three-wire system circuits.

Attractively finished and of superior performance but at very low list and net prices.

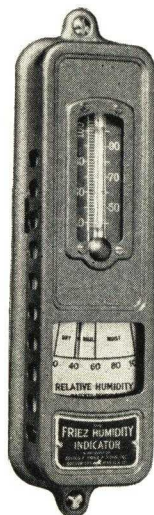
Also Complete Control Assemblies for Air Conditioning equipment.

Full engineering service freely available for solution of special Air Conditioning problems.

Write for Bulletins S. 1, 2, 3 and 4.



Humidistat



Humidity Indicator

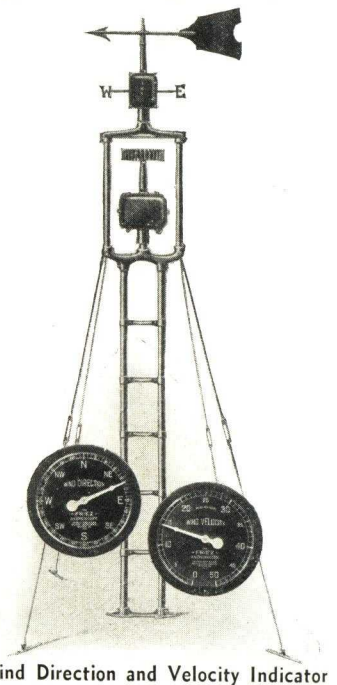
Airport Equipment

For indicating and recording all meteorological conditions important to aviation.

Wind Direction and Velocity Indicators and Recorders

Complete instrument assemblies for indicating and recording wind direction and velocity. The type illustrated gives distant indications by means of self-synchronizing motors. The same transmitters may be used to operate a recorder writing a graph of every minute fluctuation in either velocity or direction. The installation may include a combination of both indicators and recorder or either may be employed separately.

This is but one of several types of wind instrument equipment. Complete details of all are available and will gladly be dispatched upon request.

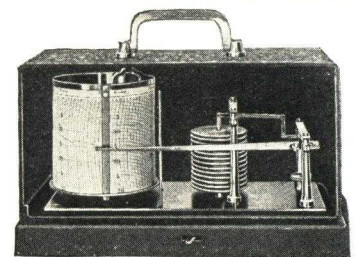


Wind Direction and Velocity Indicator

Barographs

Syphon Vacuum Chamber Type. Illustrated is the Station Barograph which records barometric pressure on the ground. A complete range of Altitude Barographs for checking altitude record flights is also listed.

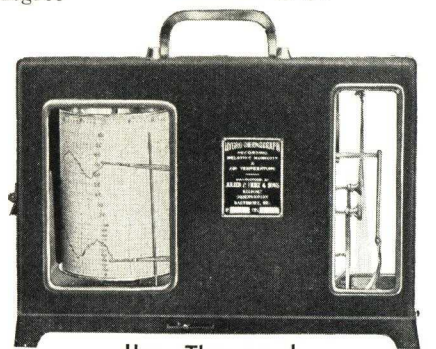
Friez Barographs incorporate the syphon element as a featured specialty. This type reduces hysteresis to a minimum and makes possible temperature compensation accurate to a degree hitherto unknown.



Station Barograph

Hygro-Thermographs

For recording temperature and relative humidity directly and on the same chart. These two air conditions are so essentially interdependent that for many investigations a record of either is of little value without a continuous, simultaneous record of the other. Friez Hygro-Thermographs employ Bourdon tubes and strands of human hair as their actuating elements for temperature and humidity respectively.



Hygro-Thermograph

Catalogue

Write for complete Catalogue No. 5-S.E.

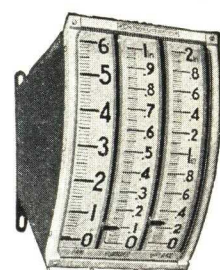
THE HAYS CORPORATION

Combustion Instrument Specialists Since 1901
900 Eighth Street, MICHIGAN CITY, IND.
REPRESENTATIVES IN ALL PRINCIPAL CITIES

Products

DRY TYPE POINTER DRAFT GAGES; U-TUBE, DIRECT READING and VERNIER SCALE DRAFT GAGES; AIR FILTER GAGES; CO₂ and DRAFT RECORDERS, COMBUSTION METERS for CO₂, DRAFT and FLUE GAS TEMPERATURE; FLUE GAS ANALYZERS (Orsats); PORTABLE COMBUSTION TEST SETS; DRAFT RECORDERS; BOILER PANELS; IGNITION VELOCITY METERS; PORTABLE HAND OPERATED GAS CALORIMETERS; RECORDING GAS CALORIMETERS.

Hays Dry Type Pointer Gages for Draft, Pressure and Differential in Wall, Flush Panel and Portable Cases



V Type, 1 to 20 Scales



F Type, 1 or 2 Units

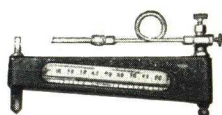


J Type, 1 or 2 Units

All Hays Pointer Gages are of simple design, beautifully finished. They are accurate and reliable. Calibration is permanent. Over 8000 in service in stationary and marine plants. Write for Catalog PGA-32.

Inclined Tube Gages

We offer a complete line of Inclined Tube Gages for ranges between 1/2 in. water and 4 in. water, in portable and wall mounted styles. Also U-Tube (Manometer), Direct Reading Single and Multiple Tube and Vernier Scale Gages. Write for Bulletin 2003.

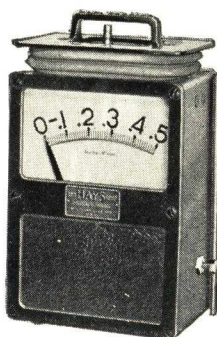


Inclined Tube Gage

Introduced seven years ago, Hays Dry Type (no liquids) Pointer Gages have revolutionized draft gage design. They are now offered in "B," "F," "J" and "V" type cases, as illustrated, in ranges between 1/8 in. water to 100 in. water, for draft, pressure and differential draft or pressure and for wall or flush panel mounting. Temperature and pressure units can also be incorporated. Also offered in a full line of single and two-unit Recorders, for either 8-in. or 10-in. charts. The operating mechanism consisting of a durable slack leather diaphragm and a phosphor-bronze spring produces the smoothest and most definite action imaginable.

Leather used is four thicknesses of a special animal membrane tanned to retain the natural animal oil. Makes a tough, flexible, airtight diaphragm which will last for many years. Avoiding use of floats, liquids and tanks makes leveling unnecessary. Hays Pointer Gages work just as well on rolling ships as in stationary plants.

The Type "B" Gage at right is furnished in portable, wall and flush cases. It is ideal for indicating resistance through air filters. Write for Bulletin 2000.



B Type, 1 or 2 Units



"U" Tube Gage

Combustion Recorders

Hays Combustion Recorders for CO₂, operating on the Orsat principle, are offered in a number of styles which combine either or both records of Over Fire Draft and Flue Gas Temperature on the same 10-in. chart with CO₂. A CO₂ Only (illustrated) or CO₂ and Draft Indication can be supplied in addition to the record. Hays Combustion Recorders can be remote mounted with the Analyzer section located up to 100 ft. distant from the Recorder or Recorder-Indicator. This eliminates necessity for long gas lines, makes lag negligible and yet adds no electrical or mechanical transmitting devices, the standard Hays CO₂ Analyzer section being employed to transmit pneumatically. All Hays Combustion Meters are offered in either wall or flush panel cases.



Hays Combustion Recorder-Indicator

Hays CO₂ Recorders employ a small stream of water which is first used to chill and precipitate out the sulphur mist and water vapor present in flue gases and which would otherwise cause so much gas line trouble. Next it is used to continuously aspirate the flue gases to the machine. Then the same water is employed to operate the CO₂ Analyzer and automatically compensate for pressure and temperature of the gas sample. And before being wasted this water is used a fourth time to automatically level the caustic potash. Only the Hays CO₂ Recorder compensates for all variables of pressure, temperature and liquid level. This assures you of years of accurate, dependable service. Write for Catalog RG-33.

Should you require an indicating machine without the chart record, write for Bulletin RIE-32.

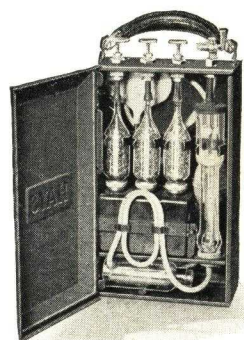
CO₂ Analyzers

For CO₂ Only, Oxygen Only or for CO₂, O₂ and CO.

Monel metal needle valves, easily renewable pure nickel seats, hard rubber chemical bottles with threaded neck, molded glass absorption pipettes and our patented steel wool method of absorption distinguish this latest model Hays Orsat.

Can be completely disassembled with a pliers and screw driver in two minutes.

Offered in 14 ranges in 50 cc and 100 cc sizes. A burette for every purpose. Special burettes made to order. Over 30,000 in service. Write for Catalog TSE-33.



Analyzer for CO₂, O₂ and CO



TS-1011 Portable Combustion Test Set

Hays Portable Combustion Test Sets

At the left is illustrated our TS-1011 Test Set comprising carrying case, Dry Type Draft Gage Thermometer and CO₂, O₂ and CO Flue Gas Analyzer. We offer fifty combinations of Combustion Test Sets. Write for Catalog TSE-33.

LEEDS & NORTHRUP COMPANY

Pyrometers, Thermometers, Laboratory Instruments, Power Plant Instruments, Metered Combustion Control, Heat-treating Furnaces

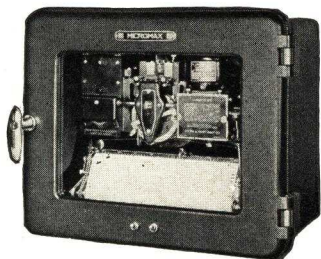
4901 Stenton Avenue, PHILADELPHIA, PA.

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MICROMAX—"THE RECORDERS OF A HUNDRED USES"



Micromax Strip-Chart
(Model S) Recorder



Micromax Round-Chart
(Model R) Recorder

Motor-driven, null type recording machines that may also signal and control. Two models—the widely-known strip-chart (Model S) Recorder, and the new round-chart (Model R) Indicating Recorder. One or the other meets practically any power-plant or production department need. Both have same general advantages:

Sturdy and reliable. Records are bold and clear. Calibrations are permanent and accuracies high. No adjustments to stepping mechanism. Cases mount either flush in panel or hanging on front of wall or panel; they are dust-proof and strip-chart case is readily made vapor-proof. Instantly accessible both as to charts and mechanisms. Either synchronous or governed motors.

Micromax Records are made for the following power-plant uses:

Pyrometers for every purpose; products of long L&N experience as pioneers in introducing potentiometers to industry. Accuracy unaffected by variations in lead resistance. Strip-chart Micromax standardizes itself. Catalog F-87.

CO₂ Recorders use only alternating current—no battery, rectifier, charger, voltage regulator. Only a-c equipment made; simpler than d-c just as a-c radio is simpler.

Stator Temperature Recorders show temperature of 6 places in stator winding and of incoming and outgoing cooling air. Bulletin F-871.

Field Temperature Recorders give a continuous record of the temperature of the rotor. Bulletin F-871.

Transformer Temperature Recorders are usually either a-c or d-c. Wheatstone bridges. Standard practice is to use one



4-point recorder to each bank of 4 transformers. Bulletin F-871.

Room Temperature Recorders show temperatures in up to 16 rooms, air ducts, etc., in heating, ventilating and air-conditioning of buildings. May be wet-and-dry bulb temperatures if desired. Catalog F-80.

Relative Humidity Recorders are direct reading. Especially valuable in biological laboratories, photographic manufacturing plants, large warehouses, etc., where the amount of refrigerated space or the product's sensitivity to moisture make every fraction of per cent of relative humidity very important, and precision of Micromax thus enables large savings to be made.

Per Cent Leakage Recorders show directly the percentage of cooling water that has leaked into a steam condenser. For any turbine rating the engineer does not have to compute carry-over, variations in rate of steaming, etc. Circular F-23151.

Conductivity Recorders show impurities in boiler water, condensate, distillate, etc. Bulletin F-496 and Circular F-303.

pH Recorders show effective alkalinity (or acidity) of either boiler-feed or make-up water, as a safeguard against acid water, or as a check on feed-water treatment. Catalog F-75.

Speed Recorders for recording the speed of turbines. Send for further information.

Frequency Recorders continuously record variations in system frequency. Used by practically all U. S. power companies. Bulletin F-985.

Load Recorders show load of remote generating stations, amount and direction of power transfer on tie lines, output of frequency-changer stations. Load may be measured 100 miles or more from Recorder. Uses only telephone pair to transmit readings. Loads may be added or subtracted automatically and the totals recorded as system total.

Smoke Density Recorders are potentiometers that show smoke density direct. Simple, economical, reliable. Circular F-6591.

Other Micromax Recorders are made for chemical strength, SO₂, etc., voltage, current, resistance, low potential, radio fading, and many other quantities.

L&N Wall-Type Indicators for same measurements as Micromax Recorders. Same accuracy as recorders.

L&N Indicators for wide variety of measurements, and used practically anywhere. Available for either semi-precision or high-precision work.

OTHER L&N RECORDING AND INDICATING INSTRUMENTS

L&N Metered Combustion Control

Metered Combustion Control supplies air and fuel to each boiler, in measured proportion, to maintain efficient combustion, and in proper amounts to maintain an accurate rate of combustion on each boiler. It is instantly interchangeable with push-button control.

Advantages:

- (1) Gives test efficiency under operating conditions.
- (2) More constant steam pressure.
- (3) Lower average excess air.
- (4) More equal division of load between boilers.
- (5) Ease in handling fluctuating loads.
- (6) Help in maintaining high efficiency.
- (7) Labor saving to firemen.

Mueller Bridge for Fuel Calorimetry

Enables user to read temperature to third or fourth decimal place, and thus have temperature reading as accurate as weight reading. Mueller bridge is also convenient for other high-precision temperature measurements. Requires no resetting when room temperature changes. Circular F-8067-G.

L&N Automatic Frequency and Load Control

Regulates speed of generator or generators. Used in both isolated and interconnected stations. If more than one generator is regulated the load is distributed between them, either proportionally to or in accordance with efficiency characteristics of individual generators. Bulletin "Frequency Control."

Type K-2 Potentiometer

For highly precise measurements of current and voltage in meter laboratories, etc. Probably the most widely used type of high-precision potentiometer. Circular F-7552-G.

L&N Optical Pyrometer

For measuring temperatures of fuel beds, furnace linings, metals when being poured or forged, and other applications where thermocouples cannot be installed. Ranges 1400° to 5000° F. Catalog F-86.

Other L&N Instruments and Equipments

This company also makes Hump and Homo heat-treating furnaces, and a wide variety of special testing instruments. We welcome correspondence on any subject having to do with null method electric measurements.

MASON-NEILAN REGULATOR CO.

(CONSOLIDATION OF MASON REGULATOR CO. OF BOSTON AND NEILAN CO. LTD. OF LOS ANGELES)

Manufacturers of Controlling and Recording Instruments for Temperature, Pressure, Flow and Combustion

1190 Adams Street, BOSTON, MASS.

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For Mason-Neilan Reducing Valves, etc., see Manufacturers' Index

Products

PRESSURE CONTROLLERS, TEMPERATURE CONTROLLERS, THERMO-PRESSURE COMPENSATED TEMPERATURE CONTROLLERS, RATE-OF-FLOW CONTROLLERS, for steam, gas and fluids—all furnished in both Recording and Non-Recording types; FLOW METERS, for steam, gases and liquids; INSTRUMENT-TYPE LIQUID LEVEL CONTROLLERS, DIFFERENTIAL and PRESSURE LIMIT CONTROLLERS, REMOTE MANUAL CONTROL SYSTEMS, COMPENSATED DRAFT CONTROLLERS and COMPLETE COMBUSTION CONTROL SYSTEMS.

General Features

All Mason-Neilan Instruments are pilot operated. Any air or gas supply between 20 and 150 lb. may be used.

In Mason-Neilan Recording Controllers, the control function is handled by one actuating helical coil and recording function by another coil, entirely independent. Pen-drag cannot affect instrument's responsiveness.

Cases are of duralumin: light, strong, corrosion-resistant. All moving parts are machined from 18% chromium and 8% nickel stainless steel.

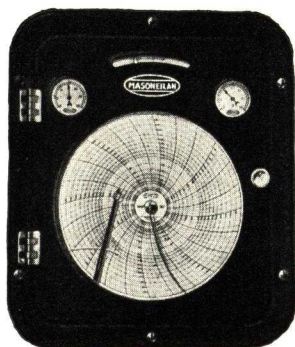
Mason-Neilan Pressure Controllers

Recording Pressure Controllers—Precision instruments which maintain exact reduced pressures or back pressures and inscribe a true chart record. Simplified design permits easy repair and adjustment by average plant operator. Ranges, from 30 in. of vacuum to 10,000 lb. pressure. Operate any size control valve from 1/8 in. up.

Non-Recording Pressure Controllers—Less expensive than recording type, and maintain exact reduced or back pressures for controlling processes which do not require a chart record. Like the recording type, they can be converted instantly from reducing to back pressure service and vice versa. Ranges from 30 in. vacuum to 10,000 lb. pressure.



Mason-Neilan Recording Temperature Controller



Mason-Neilan Recording Pressure Controller

Mason-Neilan Temperature Controllers

Both of these types are supplied complete, with standard temperature bulbs and flexible armored capillary tubing.

Recording Temperature Controllers—Highly developed instruments which accurately control temperatures by controlling supply of heating or cooling medium and draw at same time a continuous chart record of temperature. Furnished with or without the Mason-Neilan



Thermo-Pressure Compensator—an exclusive Mason-Neilan development which, by controlling and compensating pressure and resultant rate-of-flow of heating or cooling medium, provides temperature control more precise than has ever before been available. Ranges from -25° F. to 1100° F. Operate any size control valves from 1/8 in. up.

Non-Recording Temperature Controllers—These instruments provide same accuracy of control as recording type, where chart records are unnecessary.



Mason-Neilan Rate-of-Flow Controller

Mason-Neilan Recording and Non-Recording Rate-of-Flow Controllers

Of the differential orifice meter type, suitable for use with venturi throats or pitot tubes. May be converted easily and quickly for any differential range required. Consistent accuracy and long life assured by machining mercury pots from stainless steel. Regularly furnished in differential ranges: 0 to 20, 0 to 50 and 0 to 100 in. of water.

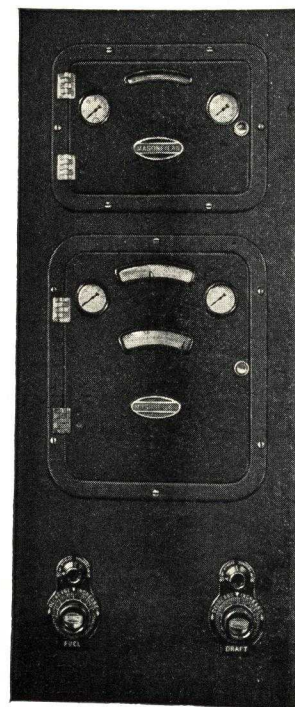
Complete Combustion Control

Complete Combustion Control for any boiler may be obtained by using the Mason-Neilan Draft Controller and Mason-Neilan Boiler Pressure Controller. Together, they maintain uniform boiler performance and highest combustion efficiency under all conditions of load, variations in natural draft, etc. Instruments are commonly mounted on a single panel, as shown, which may be installed in any convenient position. Both the Draft Controller and Boiler Pressure Controller may also be installed separately.

Compensated Draft Controller—Mason-Neilan Compensated Draft Controllers control the position of inlet, uptake or stack dampers and speed of forced or induced-draft blowers (either motor or steam-operated) and so maintain proper air-fuel ratio for perfect combustion. Instrument may be applied to oil-fired, stoker-fed or pulverized coal installations. Mounted on an attractive panel, complete with means for shifting instantly from automatic to manual control whenever desired.

Like all other Mason-Neilan instruments the Draft Controller is fully compensated to eliminate cycling, hunting or over-control. In many installations the savings in fuel alone pay for the equipment in two months' time. Furthermore, in insuring proper combustion it prevents smoking with its attendant annoyances.

Compensated Boiler Pressure Controller—This instrument controls the supply of fuel oil, stoker speed or pulverized coal rate in accordance with boiler steam pressure. It also controls dampers and fan engines wherever desirable. A system of compensation prevents hunting or over-controlling. This instrument is also furnished on a panel complete with the manual control feature.



Mason-Neilan Complete Combustion Control System

Bulletins

Descriptive bulletins on Mason-Neilan products sent on request.

THE PALMER COMPANY

226 Clay Street
CINCINNATI (ST. BERNARD), OHIO

PALMER "RED-READING" MERCURY THERMOMETERS

"As Easy to Read as a Stop Light"

These are *pure, clean mercury* thermometers which show a bright red color in the reading column instead of the silvery mercury color. Nothing has been added to the mercury to change its purity. The "Red-Reading-Mercury" in the column is accomplished by means of reflection. Mercury is a natural mirror so that by placing a strip of red or colored glass to the side of the bore or reading column, and by having this bore turned to a slant, the red glass is reflected on to the mercury column. Thus when seen through the lens in front of the tube only, the red color is visible.

Palmer thermometers are guaranteed for accuracy, A-1 material and workmanship.

Every tube is annealed and treated so that it will not change with age.

Thermometers with glass front protection (like illustration), are furnished in three standard case sizes: 12, 9 and 7 in.

Thermometers without glass front are made in: 4, 4½, 6 (hot water type only), 7 and 9 in.

Designs—Designs of thermometers are as follows:

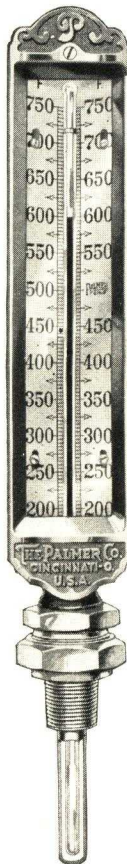
Straight type (like illustration).

90° angle type.

Side angle type (right or left): thermometer case facing straight but with stem extending to the right or left of case.

Reclining case type: case reclining with stem in vertical position.

Inclining case type: case inclining forward with stem in horizontal position.



Obtuse or oblique angle type: stem extending at various angles from the straight case.

Fittings—Thermometers are made with the following fittings:

Plain shank.

Fixed stationary flange.

Adjustable clamp flange (movable up or down stem).

Adjustable clamp hook (used when attaching thermometer to side of open kettle).

Fixed taper thread connection (½, ¾ or 1 in. iron pipe size threads).

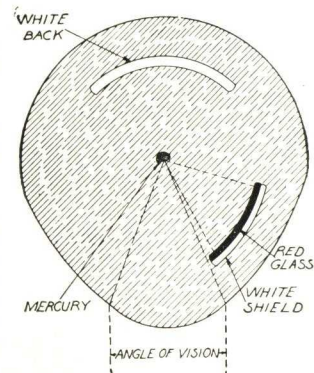
Threaded union connection (when space will not allow case of thermometer to be turned when installing, this fitting is recommended).

Separable socket connection (thermometers can be removed for repairs, etc., and socket remains in tank, etc., so that contents do not have to be emptied when removing thermometer).

Parallel thread connection (on thermometers with stem extending into oven or room, locknut is used to fasten stem to the inner wall. Specify wall thickness always on these thermometers).

Flanged union connection (similar to union connection but with flange which can be fastened to outside wall).

Note: When ordering flanged connections, specify holes to be drilled in same.



Sectional View Through Glass

Note that mercury is not disturbed or harmed by adding any chemical to change its color. You have the effect of reading a bright red column, with all the valuable properties of pure mercury.

Engraved Thermometers for Laboratories

For laboratories, testing departments, etc. High-grade thermometers made of annealed glass, with graduations on the glass tube. Furnished in either plain round front or magnified lens glass.

Accuracy Guaranteed—All chemical thermometers which we manufacture are of the highest grade, being thoroughly annealed and tested. These thermometers are all American made, manufactured in our modern, up-to-date plant. Metal armor can be furnished for chemical thermometers in two styles:

← **Perforated Style**
and **Pocket Style** →

All chemical thermometers are made for total immersion. If partial immersion is wanted, specify depth in inches.

Write for new catalogue.

When Ordering Thermometers

Remember to specify the following:

- (1) Size of case.
- (2) Style: straight, angle, reclining or inclining, side angle, etc. (a) If reclining or inclining, state degree of angle; (b) if side angle, state right or left.
- (3) Kind of connection.
- (4) Size of thread (if thread connection).
- (5) Length of stem.
- (6) Working temperature or range.
- (7) Fahrenheit, centigrade, etc., scale.
- (8) Finish: nickelplated, polished brass, etc.
- (9) Purpose for which thermometer is to be used: liquid or air.
- (10) If for oven or room, give thickness of wall.

Notes: On angle type oven or room thermometer it is advisable to have 10 to 12 in. of stem extend into oven or room to get true reading.

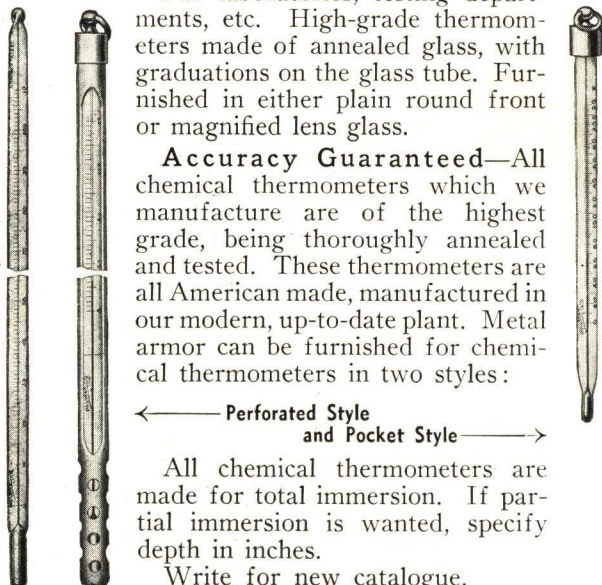
Unless otherwise specified, all thermometers are equipped with a strong but very sensitive mercury chamber around bulb. Where air temperature is taken, specify this. For these thermometers, we furnish a perforated stem around bulb, giving protection and allowing air to reach bulb quickly.

Thermometers can be furnished with insulation between case and stem when specified.

In places where thermometers must pass through insulation on pipe or extend a distance from equipment because of obstacles, thermometer can be furnished with extension neck. Specify length needed.

Catalogue No. 200A

Write for your copy of our new 68-page illustrated catalogue, featuring all types of thermometers.



TAYLOR INSTRUMENT COMPANIES

Manufacturers of Industrial Thermometers, Recording Thermometers, Regulators and Pyrometers

ROCHESTER, N. Y.

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IN CANADA: Taylor Instrument Companies of Canada, Ltd., Tycos Building, TORONTO, ONT.

MANUFACTURING DISTRIBUTORS IN GREAT BRITAIN: Short & Mason, Ltd., LONDON, ENG., E. 17

TAYLOR TEMPERATURE AND PRESSURE INSTRUMENTS FOR EVERY INDUSTRIAL REQUIREMENT

ANEMOMETERS.

BAROMETERS.

- A. Aneroid.
- B. Mercurial.

DIAPHRAGM VALVES.

DIAL THERMOMETERS.

ETCHED STEM THERMOMETERS.

HYDROMETERS.

HYGROMETERS.

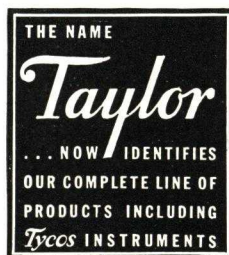
- A. Mason Form, Hygro-deik, Humidiguide.
- B. Sling Psychrometer.
- C. Wet and Dry Bulb Recording Thermometers.

INDUSTRIAL THERMOMETERS.

PYROMETERS.

- A. Indicating.
- B. Recording.
- C. Controlling.
- D. Radiation Type.

RECORDING PRESSURE GAUGES.



RECORDING THERMOMETERS.

- A. Mercury Actuated.
- B. Vapor Actuated.
- C. Gas Actuated.

REGULATORS.

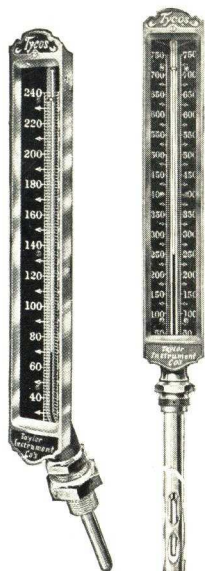
- A. Pressure.
- B. Temperature.
- C. Time.
- D. Recording.
- E. Type P—Expansion Stem.
- F. Self-Acting.
- G. Electric Contact.
- H. Thermo-Tyme.

TEST WELLS for THERMOMETERS.

THERMOCOUPLES.

VACUUM GAUGES.

- A. Absolute Pressure.
- B. Barometric.
- C. Mercury Column.
- D. Recording.



Oblique Angle

Straight Long Stem

Taylor Industrial Thermometers

Every requirement of industry is met by Taylor Industrial Thermometers. Taylor annealing process insures lasting accuracy. Design protects from corrosion or mechanical injury.

Two Types—Fixed connection for permanently attaching to pipe line or other apparatus; long stem for use on open tanks or kettles. Standard sizes are 7, 9, or 12-in. scale. All scales are individually graduated and stem materials are designed to meet conditions of use.

Taylor Industrial Thermometers are furnished with Fahrenheit or Centigrade scales in any angle form to suit the individual application and make reading easier.

Taylor Recording Thermometers and Pressure Gauges

Every variation of temperature or pressure is automatically charted on Taylor Recording Thermometers and Pressure Gauges, providing a check on the efficiency of apparatus and employees.

Three Types—Mercury, Vapor, and Gas Actuated. All can be provided with bulbs and connections suitable for use under pressure, on open tanks or any industrial application.

Accuratus Tubing—The Mercury Actuated type can be supplied with Taylor Accuratus Tubing. This tubing is so built that it automatically compensates for any surrounding temperature changes. Summer, winter, hot or cold, it makes no difference in the accuracy of recording thermometers or temperature control. The tubing may pass over steam pipes or refrigerated coils. It may run outside and be subject to all kinds of weather. Accuratus Tubing is inbuilt and compensates at the actual point of temperature change. It does not add parts to the instrument, nor does it change the external appearance of the tubing. It is by far the most wholly satisfactory compensated tubing ever offered.

Taylor Recording Thermometers and Pressure Gauges (Cont'd)

Steel experts have declared it to be the most accurate heavy wall small bore steel tubing that the world has ever produced.



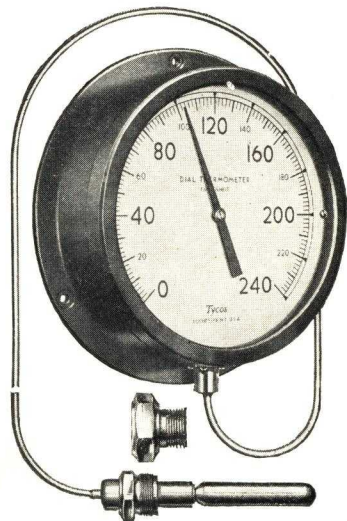
No. 8001 Taylor Recording Thermometer

Pressure and Vacuum Recording Gauges—Furnished with the same case, clock movement, etc., as Taylor Recording Thermometers.

Taylor Dial Thermometers

These instruments are constructed like the Recording Thermometers, but are equipped with indicating pointer instead of recording chart.

In appearance they resemble a large steam gauge and are as easy to read from a distance. They are made with any of the three types of tube systems, with any regular bulb and connection form, and with dials graduated to cover the required temperature range.



No. 9001
Dial Ther-
mometer

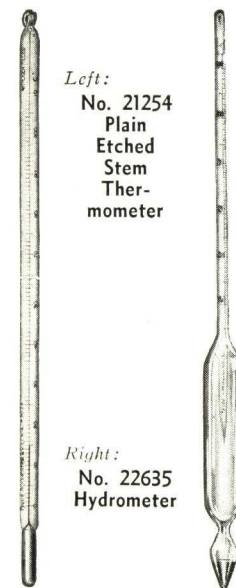
Taylor Quality Etched Stem Thermometers and Hydrometers

Etched Stem Thermometers—Made in a wide variety of scales and sizes, armored and unarmored, for general industrial and laboratory use. Accuracy guaranteed. Glass specially processed to eliminate change in calibration.

Etched Stem Thermometers designed for special applications are made for testing asphalt, sand oil, meat, dough and numerous other materials.

Maximum - Registering Thermometers—Scaled to 400° F., they register the maximum temperature to which they are exposed, and are useful where it is impossible to read the scale during actual use.

Hydrometers—Made for both general and special industrial and laboratory requirements. Accuracy and workmanship guaranteed.



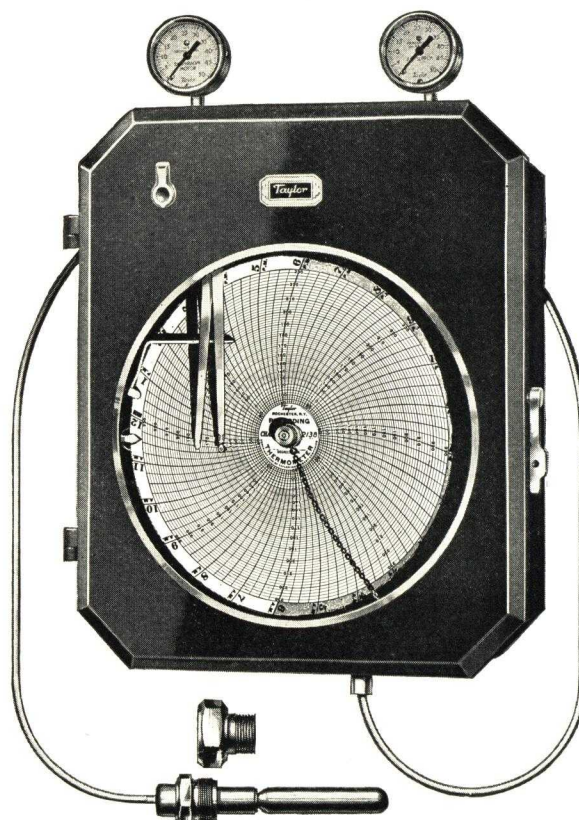
Left:
No. 21254
Plain
Etched
Stem
Ther-
mometer

Right:
No. 22635
Hydrometer

Taylor Air-Operated Temperature and Pressure Regulators

"Type-P" Expansion-Stem-Regulator—Used where point of attachment is accessible for inspecting and setting, and where there is room inside apparatus to accommodate the 12-in. or 15-in. stem. Operates from 32° F. to 250° F. Motive power is compressed air, 25 lbs. pressure to square inch recommended.

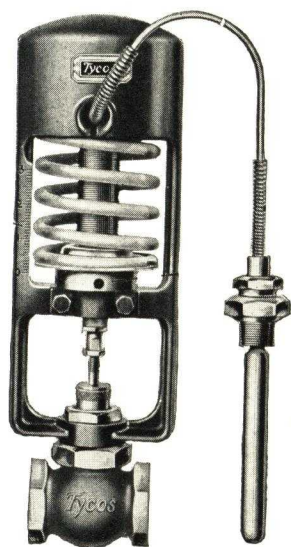
Recording Temperature and Pressure Regulators—Also air-operated, for applications where it is neces-



Taylor Recording Regulator

sary to process at various temperatures, requiring frequent change of control point. *Two types*—"Single-Duty" or "Dubl-Duty" Recording Regulators, for recording and controlling one temperature and two temperatures respectively or both temperature and pressure.

Taylor Self-Acting Temperature Regulators—Designed for use where compressed air is not available, where the expense of an air-compressor would not be warranted, and where control within close limits is not essential. Regulator is self-acting. Is not practicable on steam lines with more than 150-lb. pressure. *Control Ranges*—65-130° F., 110-170° F., 130-190° F., 170-240° F., 220-280° F. *Stainless steel bulbs. Uses*—Hot-Water Service Tanks; Pea Blanchers; Hog-Scalding Tanks; Ham-Boiling Vats; Bottle and Can Washers, etc.



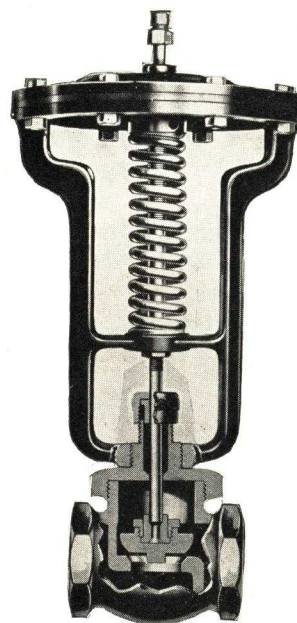
Taylor Self-Acting Temperature Regulator. An Improved Design that has made this a Superior Instrument in Its Field

Taylor Electric-Contact Indicating Temperature Controls—Operate by functioning motor-operated valves, or by causing other electric devices to operate. Designed for apparatus heated by electricity, steam, gas, or hot water, or cooled by brine, etc. Used extensively on enameling ovens, bake ovens, metal-melting pots, solder pots, refrigerator machines. *Three Types*—Mercury, Gas, and Vapor Actuated.

Taylor "Evenaction" Diaphragm Valves

Designed for use with the air-operated temperature and pressure regulators listed above. Available in all standard sizes, with valve bodies and stems suitable for different conditions of use. The "Evenaction" Diaphragm Valve has a valve-stem travel that is directly proportional to the increment of air pressure applied to its driving plate. The valve will throttle or balance at any point in the air-pressure range, regardless of the fluctuating demands of the application for water, steam or other controlled mediums. The valve will assume practically the same position for the same air pressure when opening or closing.

The Molded Diaphragm is made of thick live rubber, treated with a compound that retards aging and surface hardening. Sharp corners are eliminated. Curved surfaces at points of contact minimize cracking or weakening because they permit free rolling action throughout the full travel of the diaphragm. *These are exclusively Taylor features.*



No. 18130
Single-Seated
"Evenaction"
Diaphragm
Valve,
Direct Acting

Tycos Pyrometers

Above the range of mercury thermometers (950° F.), pyrometers are recommended for all high-temperature work. A pyrometer is also used where it is necessary to obtain readings at a distance of over 100 ft. from point of application. Taylor Pyrometers are of the high-resistance type.

Wall-Type Pyrometer—A compact, durable indicating instrument, enclosed in a dustproof and moisture-proof aluminum case. Ranges up to 3000° F.

Recording Pyrometer—Furnishes a permanent record of the temperatures existing at any particular point to which the instrument is connected.

Control Pyrometer—This controller consists of a high-resistance wall-type pyrometer of rugged construction. Controls by operating motor valves, electric heating circuits, etc. Used on electric furnaces, melting pots, ceramic kilns, etc.

Operates on 110 or 220 volt a-c., 25 or 60 cycles, no batteries or standard cells being required.



No. 4251 Wall-Type Indicating Pyrometer

For Complete Data on Taylor Instruments

Write to TAYLOR INSTRUMENT COMPANIES, Rochester, New York, or to any of their branches. Space does not permit covering all the points which have made Taylor Indicating, Recording, and Regulating Instruments standard throughout all industry.

UEHLING INSTRUMENT COMPANY

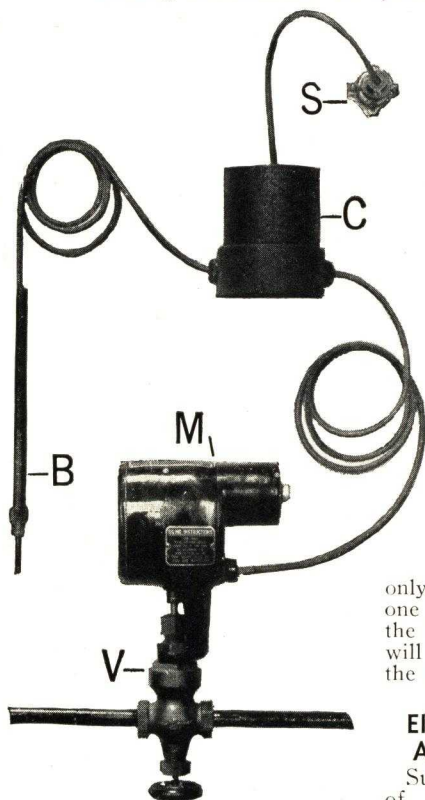
Recording, Indicating and Control Apparatus

471 Getty Avenue, PATERSON, N. J.

Products

AUTOMATIC TEMPERATURE CONTROLS; CO₂ RECORDERS and INDICATORS; ABSOLUTE PRESSURE RECORDERS; MERCURIAL PRESSURE, VACUUM, DRAFT and COMBINATION RECORDERS.
Also Potentiometer Pyrometers; Manometers.

Uehling All-electric Temperature Control



Is simple, accurate, durable, inexpensive, and easily installed. Only three electric cord connections are necessary, one to Socket S, one to Temperature Bulb B which is placed in the medium, the temperature of which is to be controlled, and one to Valve V. The size of Control Unit C is only 5 in. x 5½ in. x 5½ in. This control can be made with almost any degree of sensitivity. If desired, the Temperature Bulb B can be made so sensitive that a change in temperature of

only a few hundredths of one degree above or below the fixed setting of Bulb, will be enough to actuate the Control Unit.

Electrically Operated Apex CO₂ Recorder

Suitable for all processes of combustion and all fuels. Can be used out-of-doors (as on oil and cement kilns) because it is not affected by extremes of temperature and is well shielded against rain, dust, etc.

Accurate—Accuracy of the Apex CO₂ recorder is guaranteed within one-quarter of one per cent.

Simple—No chemical solutions; no delicate galvanometer; no steam lines; no water lines; no exhaust or drain lines.

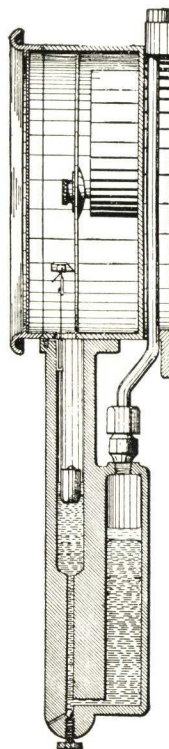
Equipment Furnished for One Boiler—Each CO₂ meter actuates a Type M recording gauge or a Type Z indicator, or both, and includes a Pyro-Porus filter, a sampling pipe holder, a gas dryer and a vacuum pump.

CO₂ Recording Gauge—Makes a continuous 24-hour record of combustion efficiency. It shows when fires needed attention and when they received it; when and how often furnace doors were opened or how often stoker speed and fuel bed thicknesses were changed; when fires were broken and cleaned; effects of changes in damper adjustment and methods of firing. It operates on the mercury column principle.

Boiler Front CO₂ Indicator—Located at the boiler front for the guidance of the fireman, who is thereby held responsible for unnecessary fuel waste.



CO₂ Recording Gauge



Illustrating Simple Hydrostatic Principle Employed

Uehling Pressure and Vacuum Recorders

The distinctive features of Uehling pressure and vacuum recorders are *simplicity, accuracy and reliability*. They employ the hydrostatic or mercury column principle and hence have no springs or multiplying levers to get out of adjustment or calibration. *The principle involved is in itself a guarantee of accuracy.*

In addition to these important advantages, the hydrostatic principle permits making the scale open between the limits where the readings are important, and narrow where they are unimportant, or eliminating that part of the scale which is of no use, thus utilizing the whole width of the chart for important readings.

Absolute Pressure Recorder

For vacuum stills, evaporating pans, condensers, and all processes where a high degree of vacuum accuracy is essential. This instrument records the barometric pressure and vacuum on the same chart. By using the barometric record as the base line the absolute pressure can be read directly. This instrument utilizes the hydrostatic or mercury column principle and hence has no springs, diaphragms, or multiplying levers to get out of adjustment or calibration.



At Right: Combined Barometer and Vacuum Recorder

(An automatic log for condensing plants)

KING-SEELEY CORPORATION

Manufacturers of the K-S Telegauge

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Manufacturing Associates: LONDON, ENGLAND and PARIS, FRANCE

The Telegauge—An Accurate and Dependable Distant Reading Gauge for Liquid Measurement

Serves a useful and economical purpose wherever the depth, level, volume, or weight of a liquid need be known

The K-S Telegauge Will

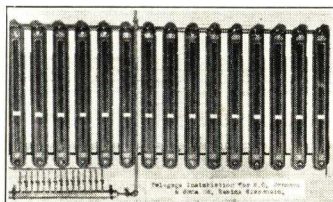
1. Centralize observation.
2. Give constant reading.
3. Eliminate "sticking" or "taping."
4. Eliminate gauging hazards.
5. Give accuracy.
6. Prevent vapor loss in gauging.
7. Eliminate one handling of liquid in formulating.
8. Eliminate personal errors.
9. Prevent loss of liquid due to overflowing.
10. Transform its cost into an economic profit.

No Moving Parts—No Wear

The K-S Telegauge is hydrostatic in principle and has no moving parts to wear out. It represents a practical adaptation of the age-old U-tube principle of balancing the weight of the liquid being measured against the known weight of the liquid in the U-tube.

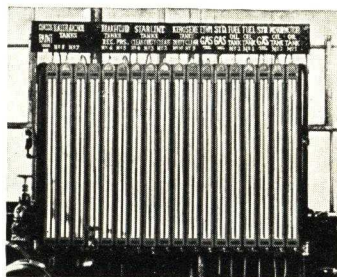
Only the highest grade material is used. Construction is rugged and service is absolutely dependable.

The K-S Telegauge is fully guaranteed to render the service for which it is designed.



S. C. Johnson & Son
Racine, Wis.

Manufacturers of the famous Johnson Floor Wax and allied products. Telegages are indicating contents of tanks containing Linseed Oil, Acetone, Naphtha, Turpentine, Chinawood Oil, Cellosolve, Lactol Spirits, Amyl Acetate, Ethyl Acetate, Toluol, Butanol, Butyl Acetate, Denatured Alcohol, Benzol, and Synthetic Methanol



Chrysler Corp., Detroit

Telegages used as a check on fuel oil, lubricating oil, gasoline, kerosene, brake fluid, alcohol, paint and enamel

Measures Any Liquid

The Telegauge measures petroleum products, water, alcohol, acids, chemicals, solvents, thinner, asphalt, ink, glue, vegetable oils, and a wide range of other liquids, including all liquids sufficiently fluid to seek their own level. Five models are available having a range from 30 in. to 44 ft. By combining two or more models the measurable depth can be increased to any desired amount.

Breweries

The K-S Telegauge is particularly adaptable to brewery tanks and casks, whether open or pressure type. Approved by the U. S. Bureau of Industrial Alcohol, its accuracy and dependability make it ideal for computing the tax on government bottling tanks.

It also serves a very useful purpose on beer tanks, fermenting tanks, hot and cold water tanks and stock tanks. Here it gives the brewer valuable processing information, as well as essential data for inventory and cost accounting purposes.

Located Anywhere—At Any Distance

The K-S Telegauge may be located any place desired, above or below and either adjacent to or at any distance from the liquid being measured. Installation is easy and simple to make, requiring no technical knowledge. Complete illustrated instructions accompany each gauge.

Engineering Department

An Engineering and Research Department is maintained at the factory for service in connection with special gauging problems.

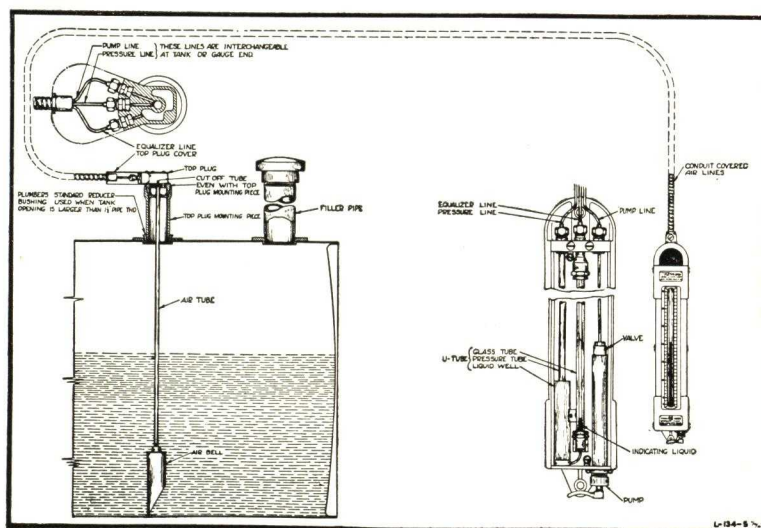
Plans and definite recommendations will be prepared and submitted for approval.

Sales, Service and Information

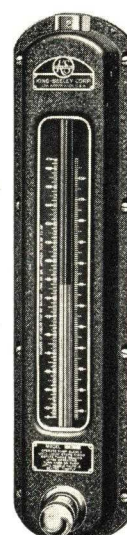
To facilitate such, District Offices are located as given above.



Red Liquid Models



Installation Diagram



Mercury Models

THE LIQUIDOMETER CORPORATION

Tank Gauges and Liquid Level Controls

Skillman Avenue at 37th Street
LONG ISLAND CITY, N. Y.

PRODUCTS

Remote or direct reading gauges, for indicating, recording, and controlling, liquid levels in tanks, vats, wells, or other containers. Instruments manufactured by THE LIQUIDOMETER CORPORATION are used by practically every industry which processes, uses, or stores liquids. They are used in liquids ranging in viscosity from butane to heavy printers ink, in acids or alkaline solutions, in heated or chilled liquids, in liquids under pressure or vacuum; on submarines and other marine craft, on airplanes and dirigibles; by public service and

bus transportation companies, railroads, laundries, dry cleaners, paint, varnish, chemical and pharmaceutical manufacturers; bakeries, dairies, ice cream, candy, and other food product companies; in sewage disposal plants, gasoline filling stations, garages, public buildings, docks, piers, power plants and dams; by oil companies, newspaper and publishing companies, and scores of other industries.

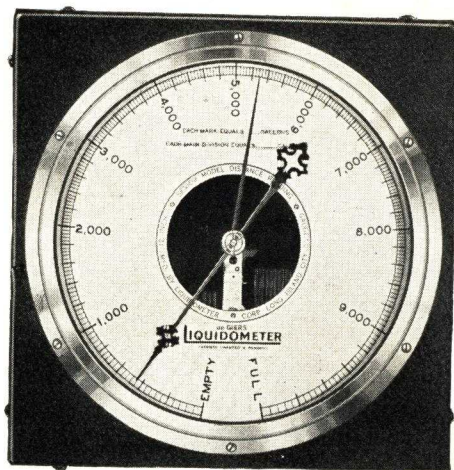
Our Engineering Department is available for suggestions on unusual gauge problems.

The Liquidometer

Liquidometer Senior and Recorder (shown), and all other Liquidometer models operate on a patented balanced liquid displacement system (not hydrostatic). All Liquidometer models are self-contained and automatic in operation, the principle difference between them being in the size of the dial and the shape of the indicating or recording case.

Liquidometers are not affected by temperature, atmospheric, or tank pressure changes. The transmission system used in Liquidometers is not confined to tank gauging, and is recognized by engineers as being the most satisfactory method of transmitting movement from one point to another.

There are no pulleys, pumps or valves used, no electrical attachments to tank, no varying sources of power. No manual operation is required to take a reading, as the dial of the Liquidometer is read as easily as that of a clock. Nearly all Liquidometer models can be equipped with attachments to automatically control pumps, motors, signals or other devices.

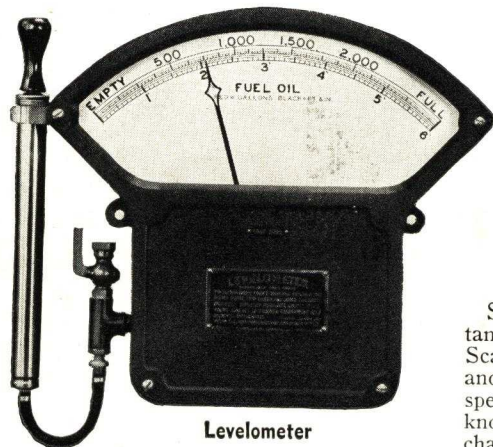


Liquidometer Senior

The Levelometer

Levelometers operate on an exclusive adaptation of the hydrostatic principle. A dial is used instead of the ordinary glass column for indication, thus eliminating the general causes of inaccuracy common to the conventional hydrostatic gauge. No liquid is used to be affected by temperature changes, to evaporate, to stain the glass, or to be blown out by pumping. Although we manufacture hydrostatic tank gauges having a glass column as a means of indication, we strongly recommend the dial type as being superior.

Levelometers seal the tanks or chambers to which they are attached. They are made to read in gallons, feet and inches, or any other desired unit of indication. They cost no more than the ordinary hydrostatic tank gauge.

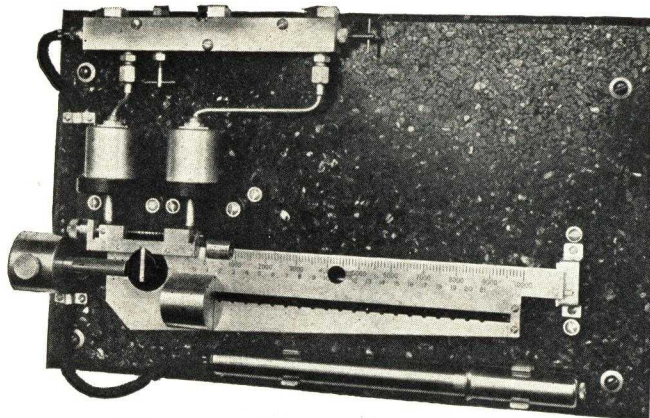


Levelometer



Liquidometer Recorder

Right:
Scaleometer



The Scaleometer

Scaleometer, as the name implies, is a remote indicating scale designed to indicate tank contents in gallons, pounds, or any other increment of measurement. The Scaleometer will measure contents of large tanks (20 ft. or higher) more closely and accurately than is possible by any other means of gauging. It can be fitted with specific gravity or Baume finder, in case the gravity of the liquid in the tank is not known. The Scaleometer is in fact a scale adapted to respond to the most minute change of liquid level in a tank.

PNEUMERCATOR COMPANY, INC.

305 East 46th Street
NEW YORK, N. Y.

EUROPE: Kelvin, Bottomley & Baird, Ltd., GLASGOW, SCOTLAND

Products

"PNEUMERCATOR" TANK GAUGES for indicating the contents of liquid storage tanks.

"PNEUMERCATOR" MERCURY COLUMN VACUUM GAUGES.

"PNEUMERCATOR" MERCURY PRESSURE GAUGE for indicating pressures up to 30,000 lb. per sq. in.

"Pneumercator" Tank Gauges

These gauges provide accurate readings of depth, weight, volume, specific gravity or Baumé of any liquid, sufficiently fluid to seek its own level.

Operation and apparatus are unaffected by corrosive liquids or changes in temperature.

They are absolute in reliability.

They provide inventory data on liquid stored, put in or withdrawn from tanks, standpipes and reservoirs.

Construction and Principle of Operation—Operation of all models is based on the maintenance of a true hydrostatic balance between the head of liquid to be measured and a column of mercury or other indicating medium, the pressure being transmitted by air confined in a small connecting tube between the liquid and the gauge.

The essential parts are: the indicating instrument, a balance chamber or chambers in the tank, connecting piping, and either a hand pump or connection to compressed air supply.

There are no floats, diaphragms or delicate mechanisms to stick or get out of order.

Gauges may be manifolded to a number of tanks of the same size (we recommend limiting this to 6 tanks); the contents of each being read separately.

Models of "Pneumercator" Tank Gauges

—**Model LTI**—Applicable to any tank whose contents have a constant specific gravity and where a reading in units of depth, weight or volume is desired. Also applicable to a straight sided tank whose contents vary in specific gravity, where an accurate reading in weight is desired. May also be applied to a horizontal cylindrical tank whose contents vary in specific gravity, where an approximate reading in depth, weight or volume is sufficient.

Scales graduated in units of depth, weight or volume corresponding to each half-inch of tank depth.

Furnished in 6 sizes, for heads not exceeding 50 ft. of fresh water or its equivalent.

Model FU—Practically the same as Model LTI except that being inclined at 30°, it gives closer readings. Graduated to read in units of depth, weight or volume with a mark for each quarter-inch of tank depth. Made in 6 sizes for heads not exceeding 60 ft. of fresh water or its equivalent.

Trade Mark Reg. U.S. Pat. Off.
Pneumercator

Model AU—For liquids of varying specific gravity. Will accurately indicate contents in units

of depth, weight or volume. Can be equipped with specific gravity finder for determination of spe-



Model AU Gauge

cific gravity or Baumé of tank contents. Furnished in standard sizes for heads not exceeding 50 ft. of fresh water or its equivalent.



Model BU Gauge

Model BU—Application similar to Model AU. Furnished in two sizes for heads not exceeding 12 ft. of fresh water or its equivalent.

"Pneumercator" Vacuum Gauge

Graduated in inches and tenths to 31 inches. It has a visible zero and an adjustment for correcting the mercury level.

Equipped with condenser to prevent moisture from collecting on top of the mercury column.

Furnished for top, side, or back connection.



Vacuum Gauge

"Pneumercator" Pressure Gauge

Applicable to any service where accuracy is an essential factor. This gauge is accurate throughout its entire range and will remain so under varying pressures.

Designed for pressures up to 30,000 lb. per sq. in. The indicating medium is mercury. Standard length of column is 36 in.

Trade-mark

The coined word "Pneumercator" is registered as our trade-mark and attached to all instruments sold by us, our representatives and licensees under our patents throughout the world.



Pressure Gauge



Model LTI Gauge

INDUSTRIAL ELECTRICAL EQUIPMENT AND SUPPLIES

ALLIS-CHALMERS MANUFACTURING COMPANY

Manufacturers of Power, Electrical and Industrial Machinery
MILWAUKEE, WIS.

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SALT LAKE CITY, UTAH, Kearns Bldg.
SAN ANTONIO, TEX., Frost National Bank Bldg.
SAN FRANCISCO, CALIF., Rialto Bldg.
SEATTLE, WASH., Smith Tower
TAMPA, FLA., 415 Hampton St.
TOLEDO, OHIO, 2nd Nat'l Bank Bldg.
TULSA, OKLA., Public Service Bldg.
WILKES-BARRE, PA., Coal Exchange Bldg.

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CANADIAN REPRESENTATIVES: Canadian Allis-Chalmers, Ltd., TORONTO

Products

MOTORS: of any size for any application.
GENERATORS: Alternating or Direct Current; Synchronous Condensers.
TRANSFORMERS: Power; Distribution-Network; Instrument-Metering; FEEDER REGULATORS.
CONVERSION EQUIPMENT: Mercury Arc Power Rectifiers; Synchronous Converters; Motor-Generator Sets.
RAILWAY ELECTRIFICATION EQUIPMENT.
ARMORCLAD SWITCHGEAR; CIRCUIT BREAKERS.
SWITCHBOARDS; CONTROL; GENERATOR VOLTAGE REGULATORS.
STEAM TURBINES and CONDENSERS.



HYDRAULIC TURBINES and AUXILIARIES.
STEAM, OIL and GAS ENGINES.
BLOWERS and COMPRESSORS: Centrifugal, Rotary, Reciprocating.
PUMPS: Centrifugal and Plunger; Pumping Engines.
TEXROPE DRIVES; TRANSMISSION MACHINERY.
INDUSTRIAL MACHINERY: Rock and Ore Crushing; Cement Making; Mining and Metallurgical; Coal Distillation; Timber Preserving; Flour and Cereal Milling; Sawmill and Wood Conservation; Road Grading; Tillage and Threshing; Combines; Wheel and Track-Type Tractors; "AKON" Boiler Treatment.

Motors

General Purpose Induction Motors—Types AR squirrel-cage and ARY wound-rotor are built in standard ratings and speeds up to 200 hp. in horizontal or vertical types. Steel frames, silver brazed indestructible rotors, form wound moisture-proof coils, dust- and oil-tight sleeve or anti-friction bearings, efficient ventilation and other desirable qualities are inherent features of these standard motors.



AR Motor

Large induction motors are built in all types, including the largest ratings in commercial service and for special torque, speed variation, etc.

Linestart Motors (Normal Torque, Low Starting Current)—These have all the features of standard squirrel-cage motors but designed to start directly across-the-line.

High Starting Torque Motors (High Torque, Low Starting Current)—These are also designed for across-the-line starting.

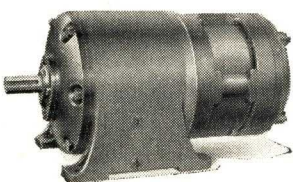


Totally Enclosed Fan-cooled Motor

Totally Enclosed Fan-Cooled Motors—Built in squirrel-cage and wound-rotor types for use where acids, alkalis, metallic dust, corrosive gases, oil, moisture, sand, carbon black, etc., are present. (Approved by the Underwriters for Class II, Group G locations, Grain dust.)

Explosion-proof Motors—These totally enclosed fan-cooled design motors have been approved by the Underwriters in some general purpose squirrel-cage ratings for Class I, Group D locations, Gasoline (Pyroxylin Lacquer Vapor).

Multi-Speed Squirrel-Cage Motors—Built open or enclosed, in the consequent pole type for 2:1 speed ratio; with additional windings for other speed ratios. These are built for the usual applications where horsepower is constant at each speed or for constant or variable torque drives.



Gearmotor Unit

Gearmotor Units—Where low speed drives are required, these units have the motor mounted directly on the helical gear reducer housing, forming a compact, rigidly mounted unit. Standard speeds at the power take-off are from 3:02 to 380 r.p.m., but slower speeds can be provided.

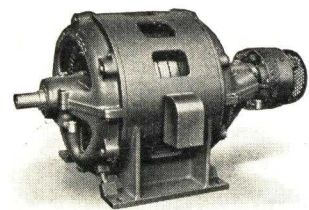
Higher Speed Gearmotors, with gear housing on motor, are built for speeds from 195 to 4000 r.p.m.

"Seal-Clad" Motors for Textile Mills—Have smooth air passages to allow free travel of lint and dust through the motor.

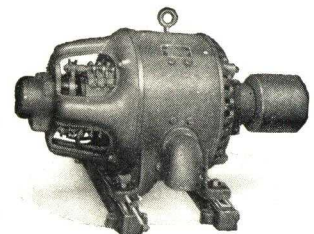
Synchronous Motors—Built in belted, coupled and engine types, 50 hp. and larger, with torque characteristics for practically all constant-speed drives and for unity or leading power factor for corrective effect on systems where the load power is low.

"Hytork" Synchronous Motors combine the starting characteristics of wound-rotor induction motors and the running characteristics of unity power factor synchronous types. They are applicable to grinding mills, conveyors, lineshaft or similar drives.

General Purpose Direct-Current Motors—Built in standard ratings up to 200 hp. for constant speeds (60 cycle speeds). Adjustable-speed ratings available for speed ranges up to 4 to 1. Both types are also built for vertical service.

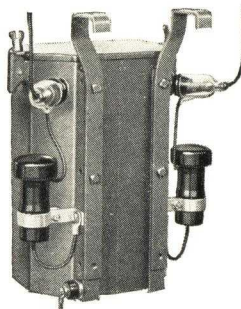


1200 R.p.m. Synchronous Motor



Type "E" Direct-current Motor

Large d-c. Motors (Frog Leg Wound), are built for hoist and other services.



Distribution Transformer with Surge-Diversers

Transformers

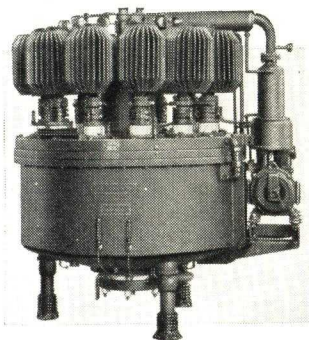
Built in all sizes and voltages—for power, distribution, instrument and metering service.

Power Transformers are built for any capacity, voltage or application, water-cooled, self-cooled or forced air-blast. **Distribution Transformers** are built single and polyphase, for outdoor, indoor, vault, network, or subway service, including conventional cable lead types, demountable stud bushing type, roof-bushing type and units with surge diverters built integral.

Automatic Feeder Voltage Regulators are of the step type self-contained, indoor or outdoor, quiet, economical, and give very smooth regulation.

Conversion Equipment

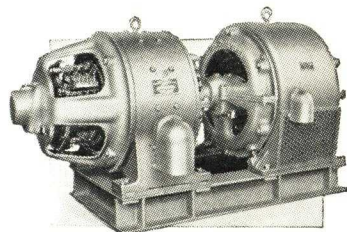
Allis-Chalmers Mercury Arc Rectifiers (*Brown Boveri Design*)—Convert alternating current to direct current without moving parts, noise or vibrations. They possess the advantage of high efficiency at all loads, low installation, operating and maintenance cost. They operate safely under the most adverse a-c. line conditions and are especially adaptable to automatic control.



600 Volt, 3000 Amp., Mercury Arc Power Rectifier

Standard rectifiers are built in sizes from 150 kw. at 250 volts up to the highest commercial ratings and voltages of converting apparatus. They are the ideal converter for railway service and for industrial substations with heavy fluctuating load and low machine load factor.

Synchronous Converters—These form another convenient and efficient means of converting from alternating to direct current. They are built in standard ratings to 3000 kw. for industrial, mining or railway service.



150-Kw. Motor-Generator Set

Induction Motor-Generator Sets—Built in ratings of 1 kw. and larger in standard commercial voltages for both d-c. and a-c. machines.

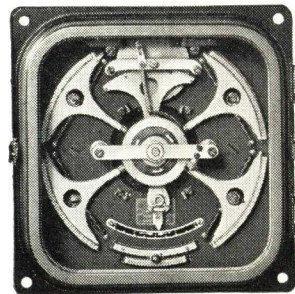
Armorclad Switchgear

Synchronous Motor-Generator Sets—Built in ratings of 50 kw. and larger in standard voltages.

These units combine into one compact factory-built unit, the bus-bar, oil circuit breaker, disconnects instrument transformers, cable pot-heads and supporting framework. Allis-Chalmers-Keyrolle Armorclad switchgear is noted for its safe, compact and sturdy construction, low maintenance and installation cost, and is available in all standard ratings for metal-clad switchgear.

Switchboards and Control

This company engineers and manufactures a complete line of switchboards and automatic control boards for power stations, substations, and industrial plants including automatic starters for induction motors and synchronous motors.



Rocking Contact Regulator

Generator Voltage Regulators

These regulators (*Brown Boveri Design*) have *rocking contacts* which do not require periodic inspection, adjustment or replacement. Once properly installed they regulate automatically with minimum maintenance. Over 26,000 have been installed in all parts of the world.

Generators

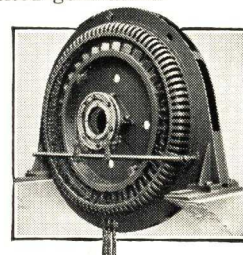
These include a-c. and d-c. machines of all characteristics and any practicable capacity—turbo-generators; water-wheel

generators, including automatic, semi-automatic or outdoor type; engine generators; coupled or belted generators.

They can be furnished with any prime mover as complete power units with steam and hydraulic turbines, steam, oil or gas engines.

Corliss Engines

These are noted for their high efficiency, reliability and long life. Having built over 6,000,000 hp. of Corliss engines during the past 50 years, Allis-Chalmers recommends and builds them to meet practically every industrial requirement.



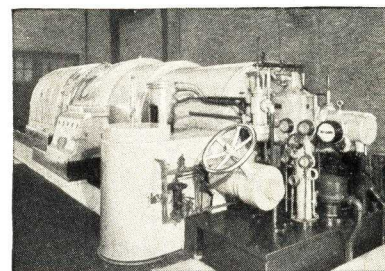
Engine Alternator

Gas Engines

Gas engines rated from 500 to 10,000 hp. are designed to operate on producer, natural, illuminating, coke oven, or blast furnace gas.

Steam Turbines

Efficient, reliable, accessible reaction type steam turbine and generator units are built from 200 kw. to 150,000 kw. or larger if desired, and for any steam pressure and temperature limited only by the suitability of present available materials. These include condensing, non-condensing, bleeder and mixed pressure types. Impulse turbines are built for auxiliary drive.



6000-Kw. Turbo-alternator Unit

Condensers

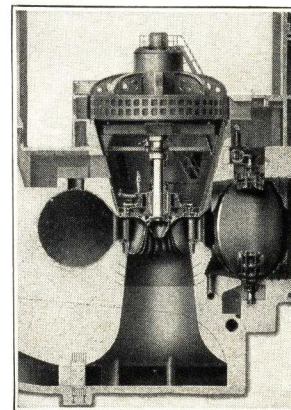
Built in surface and jet types in all sizes and including auxiliary air evactors, condensate and circulating water pumps.

Hydraulic Turbines

Allis-Chalmers hydraulic turbines now in operation or under construction, total over 6,000,000 hp. comprising propeller, Francis, and impulse types for heads ranging from 6 to 2500 ft. All are individually designed for capacities and characteristics to suit their respective developments.

Low permanent cost results from their simplicity and dependability.

Having both turbines and generators of its own design and manufacture, Allis-Chalmers can furnish complete hydro-electric units under one contract insuring undivided responsibility.

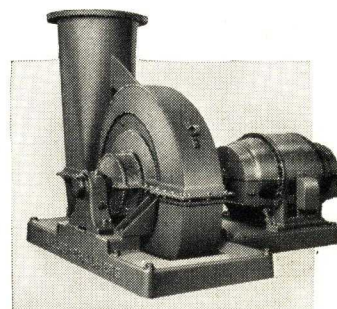


54,000 Hp. Hydraulic Turbine and 27-Ft. Butterfly Valve

Blowers and Compressors

Centrifugal Blowers and Compressors

In single- and multi-stage types, for volumes up to 130,000 c.f.m. and pressures from 1 lb. G., to 125 lbs. G., are built for Blast Furnace, Converter and Cupola Blowing, Gas Boosting, and Exhausting, Gas Generator Blowing, supplying blast for Oil-fired, Gas-fired, and Pulverized Coal-fired Furnaces, Scavenging and Supercharging Oil and Gas Engines, Pneumatic Conveying, Agitating Liquids, etc.

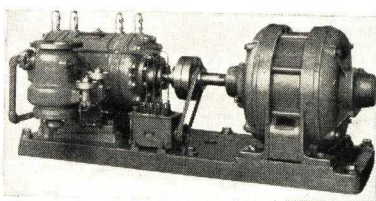


Motor Driven Turbo-Blower
32,000 c.f.m. at 2 lbs. G

Rotary Blowers and Compressors—Of the positive pressure, sliding-vane type, built for pressures up to 150 lbs. G., and volumes up to about 2000 c.f.m., in single- and two-stage types, water-cooled and air-cooled. These machines are admirably suited for use as dry vacuum pumps, for any vacuum up to 29.85 in. Hg. (referred to 30 in. barometer).

Reciprocating Air and Gas Compressors

—Built from 3000 to 15,000 c.f.m. capacity or larger for all pressures up to 5000 lbs. G. These units are built with the Company's steam engines or gas engines, or electric drives.



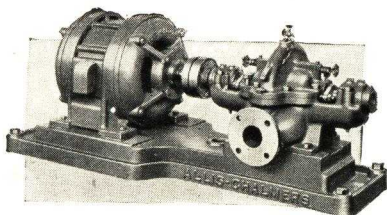
Rotary Compressor

Centrifugal Pumping Units

The ALLIS-CHALMERS MANUFACTURING COMPANY makes a specialty of combined units consisting of pump and motor power of their own manufacture as the best way of giving purchasers a complete unit with both pump and drive properly proportioned and with undivided responsibility for the performance of the unit as a whole.

The type "S" pump which is the most generally used type is a single stage, double suction, horizontal shaft, bronze fitted pump built in sizes 1½-in. to 30-in. discharge; capacities, 30 to 42,000 g.p.m.; heads up to 200 ft., and in some of the smaller sizes for still higher heads.

The type "LS" is a lower head type "S" pump used for condenser circulating pumps, sewage pumps, drainage pumps and any other service requiring large capacities against relatively low heads. Built in sizes 24 in. to 60 in.

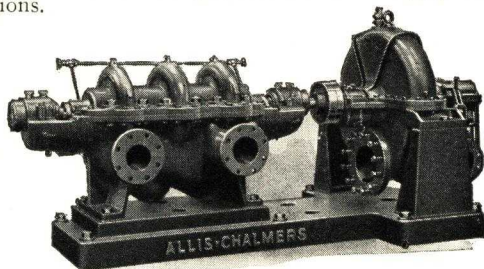


Motor Driven Type "S" Pump

Multistage Types

The multistage type centrifugal pumps are the double suction type "M" built in sizes 2½ in. to 16 in.; good for pressures up to 1500 lbs. in some sizes and depending on arrangement; the type "ST" built in sizes 2½ in. to 14 in.; the type "HYC" which has two-stage, back-to-back impellers and is built in sizes 4 in. to 14 in.

The type "M" pump is used for boiler feed service, oil pipe line pumps, fire service, high pressure water supply and similar applications.



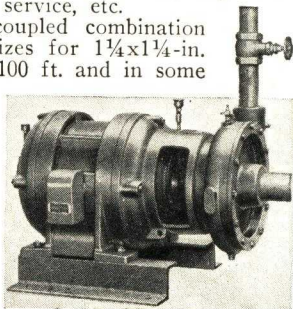
Type "M," with Steam Turbine Drive

Other Types

The type "SSOR" pump is used for handling high consistency paper stock, for sewage service, etc.

The type "SSU" is a close-coupled combination pump and motor unit built in sizes for 1¼x1¼-in. to 4x3-in. sizes for heads up to 100 ft. and in some of the sizes 200 and 300 ft. These pumping units have a multitude of uses, water supply, or air conditioning and washing machines, cooling water supply, oil industry and anywhere else a small, reliable, efficient pumping unit is required.

General catalog 1632L describing the Company's complete line of Centrifugal Pumps sent on request.



Type "SSU"

Texrope Drives

(Texrope—Trade-mark Reg. U. S. Pat. Off.)

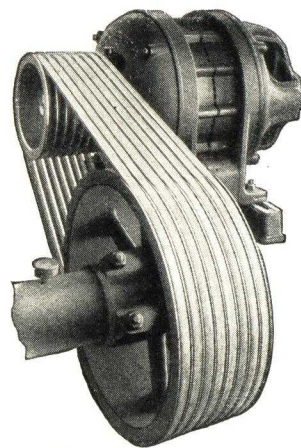
"Texrope" is the trade name and registered trade-mark of V-belt drive products of ALLIS-CHALMERS MANUFACTURING COMPANY.

Allis-Chalmers multiple V-belt drive is a patented product. This drive consists of a number of trapezoidal shaped, endless flexible belts running in V-shaped grooves. Power is transmitted by the wedging contact between the Texrope Belts and the grooves in the sheaves.



Advantages

- Positive yet flexible.
- Permits close coupling of driving and driven shafts.
- Smooth-starting—shock absorbing.
- Requires no lubrication and little attention.
- Silent always.
- Multiple belts of high overload capacity insure continuity of operation if one or two fail.
- Operates well in dusty or moist locations.
- Economical.
- Extensive tests prove high efficiency.
- Pressure on bearings is unusually low.
- Reverses as easily as an induction motor.
- Operates in any position.
- Slight adjustment takes up stretch.
- In about seven years, over 150,000 Texrope Drives aggregating more than 2,000,000 hp. have been applied to almost every form of industrial machinery for ratings ranging from ¼ hp. to 2000 hp. The Texrope drive was pioneered and is backed by an organization specializing in power and its utilization in industry, and has received the endorsements of leading engineers all over the world.



Typical Texrope Drive

Stock, Standard and Special Ratings

Stock Drives—For immediate shipment from various consigned stock points, are available for all popular motor ratings from ½ to 100 hp. There are 64 to 83 different ratios for each rating so that practically any speed reduction or increase can be had within the range of 1:1 to 7:1.

Texsteel Texrope Drives—¼ to 15 hp., also available from stock, supply the demand for a low priced unit. Texsteel sheaves are accurately formed of extremely tough steel, then welded and attractively finished in an aluminum lacquer. They are light in weight and easily installed.

Standard Drives—Not in stock, command early shipment since patterns are on hand and standard drawings are already complete. Standard drives are available for ratings between 50 and 300 hp.

Texrope Drives or Belts for all requirements can be selected from Catalog 150, available on request; also picture bulletin No. 1228.

Special Drives—Include large or special ratings and drives to suit special conditions, also flywheel sheaves for compressors or crushers, clutch applications, rim sheaves, etc. Split or clamp hub sheaves are furnished where required.

Texrope Belts

Texrope belts are made in accurately machined molds, in five cross-sectional sizes and various lengths suiting all requirements. These are also available for immediate shipment from various consigned stock points.

General Power Transmission Machinery

The Company builds a complete line of substantially built power transmission machinery for heavy duty continuous operations, including: Shafting to large sizes; Friction Clutches and Couplings; Bearings, etc.; Cast Iron Pulleys; Tighteners; Rope Transmissions; Iron and Mortise Gears; Fibre and Iron Frictions; and Sawmill and Flour Mill Elevating and Conveying Equipment. Write for Power Transmission Catalog stating your requirements.

GRAYBAR ELECTRIC COMPANY

Electrical Equipment for Office and Industry

Graybar Building, Lexington Avenue and 43rd Street
NEW YORK, N. Y.

DISTRIBUTING HOUSES

AKRON
ALBANY
ASHEVILLE
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BEAUMONT
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SAVANNAH
SEATTLE
SPOKANE
SYRACUSE
TACOMA
TAMPA
TOLEDO
WASHINGTON
WICHITA
WORCESTER
YOUNGSTOWN

Products

GRAYBAR ELECTRIC COMPANY brings to meet the needs of industry more than 60,000 electrical supplies—supplies whose quality is warranted by Graybar's 64 years of experience.

The 75 distributing houses listed above bring these supplies within arm's reach of demand everywhere, making instantly available everything electrical, to transmit, apply and control electricity in factory, office, home, store, theater and apartment.

A Few of the 60,000 Items Listed in The Graybar Electric Catalog 100

The following products cover only a very small portion of the 60,000 products listed in the Graybar Electric Catalog, a book of 1085 pages, which has proven its value to engineers, architects, purchasing agents, etc.

Write for your copy to our nearest office or address GRAYBAR ELECTRIC COMPANY, Graybar Building, Lexington Avenue and 43rd Street, New York, N. Y.

Power Apparatus

For general power service, GRAYBAR ELECTRIC COMPANY offers alternating and direct-current motors of rugged construction to meet a wide range of requirements. We can also provide correct control for every motor application.



Inter-communication

Graybar Inter-Phones provide direct inter-communication between points in one or several buildings.

Various systems have been developed to cover a wide range of conditions. These are the identical Inter-Phones that were formerly marketed under the name of Western Electric Inter-Phones.



Safety Switches

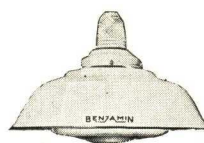
These switches safeguard men and machinery against the accidents common with obsolete open knife switches.

Enclosed switches are designed for use with all types of motors and to control lighting and power circuits.

A Complete Lighting Service

GRAYBAR ELECTRIC COMPANY offers a complete line of representative types of lighting units, for offices, factories, and outside areas. Also standard lighting units for direct, semi-indirect, and indirect lighting systems; floodlights and porcelain enameled steel reflectors.

Competent lighting specialists may be consulted without obligation, through GRAYBAR ELECTRIC COMPANY offices.



Sunbeam Mazda Lamps

Sunbeam Mazda Lamps are available on quick call at GRAYBAR ELECTRIC COMPANY distributing houses conveniently located in 75 principal cities through the country.

These well-known, extremely efficient lamps are stocked in the five standard sizes—25, 40, 60, 100 and 200 watts—adopted to simplify ordering.



Wiring Supplies

GRAYBAR ELECTRIC COMPANY distributing houses carry large stocks of wiring supplies for power, light and inter-communication construction and maintenance. This includes wire, conduit, wiring devices, conductors, etc., for all purposes. All materials are standard quality, the products of long established, well-known manufacturers.



WAGNER ELECTRIC CORPORATION

ST. LOUIS, MO., U. S. A.

SALES OFFICES

ATLANTA, GA., 14-20 Alexander Street, N. W.
BALTIMORE, MD., 2316 No. Charles Street
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BUFFALO, N. Y., 1796 Main Street
CHICAGO, ILL., 1935 So. Indiana Avenue
CINCINNATI, OHIO, 2125-27 Reading Road
CLEVELAND, OHIO, 3756 Carnegie Avenue
DALLAS, TEX., 734 Allen Building
DENVER, COLO., 629-30 Denham Building
DETROIT, MICH., 5535 Woodward Avenue
MONTREAL, QUE., 819 Tramways Building

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KANSAS CITY, MO., 1615 Baltimore Avenue
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MEMPHIS, TENN., 689 Union Avenue
MILWAUKEE, WIS., 925-927 North Broadway
MINNEAPOLIS, MINN., 1225-31 La Salle Avenue
NEW YORK, N. Y., 30 Church Street
TORONTO, ONT., 183 George Street

OMAHA, NEB., 2038 Harney Street
PHILADELPHIA, PA., 1720-26 Callowhill Street
PITTSBURGH, PA., 4900 Baum Boulevard
PORTLAND, ORE., 11th and Everett Streets
SALT LAKE CITY, UTAH, 153 W. Second South Street
SAN FRANCISCO, CAL., 457 Ninth Street
SEATTLE, WASH., 1918 First Avenue, So.
ST. LOUIS, MO. (Factory), 6400 Plymouth Avenue; (City Sales) 1218 Olive Street

Wagner Motors

Squirrel Cage (Polyphase) Motors

—Normal-torque (general purpose and across-the-line), low-torque (across-the-line), and high-torque (double squirrel cage, punch press and elevator) types; single or multi-speed; open, totally-enclosed fan-cooled and explosion-proof frame construction; horizontal and vertical; sleeve, ball or roller bearing; 2- and



3-phase, all standard cycles and voltages. $\frac{1}{10}$ to 400 hp. Described in Bulletin 174.

Slip Ring Motors—1 to 250 hp. Start heaviest loads smoothly without objectionable line disturbance; for constant or adjustable varying speed on elevators, cranes, hoists, crushers, triplex pumps. Described in Bulletin 169.



Fynn-Weichsel (Synchronous) Motors— $7\frac{1}{2}$ to 200 hp. For power factor correction and constant speed at all loads, high starting and pull-in torque. Described in Bulletin 176.



Repulsion-Induction (Single-phase) Motors—Brush-lifting (assures quiet operation and long brush and commutator life); open, air-jacketed and explosion-proof frame construction; horizontal and



vertical; sleeve or ball bearings. $\frac{1}{10}$ to 15 hp. Described in Bulletins 167 and 173.

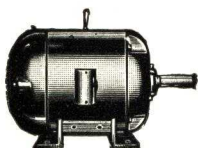
Split-phase Motors—Long-life switch and unbreakable steel frame. Drip-proof or totally closed end plates. Available also with double shaft extension outfitted with grinder and buffer (known as Grind-R-Buffer motors). In $\frac{1}{10}$ to $\frac{1}{2}$ hp. Described in Bulletin 167.



Resilient-mounted Motors—For ultra-quiet operation. Frame is insulated from base, so designed as to absorb vibrations without affecting shaft alignment. Described in Bulletin 167.

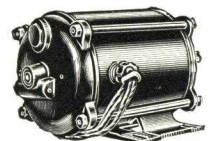
Condenser Motors—For fan or blower duty. Especially adaptable for quiet, slow-speed operation. $\frac{1}{30}$ to $7\frac{1}{2}$ hp. Described in Bulletin 167.

Totally-enclosed Fan-cooled Motors—To 20 hp. single-phase, 60 hp. polyphase. Motor is totally enclosed in dustproof frame. Fan mounted on outside cools motors to within N.E.M.A. limitations. Approved by Underwriters for grain elevators and similar applications where explosive dust prevails. Proof against dust, fumes and moisture. Described in Bulletin 174.



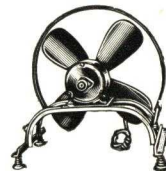
Vertical Motors—Designed to operate in horizontal and oblique positions as well as vertically. In all types: squirrel cage, repulsion-induction, split-phase, condenser, direct current—all interchangeable for given horsepower ratings. Described in Bulletins 167 (single-phase) and 174 (polyphase).

Special Motors for Hazardous Gases— $\frac{1}{4}$ to $\frac{1}{2}$ hp. Totally enclosed. Endorsed by Underwriters for operation where hazardous gases prevail. Described in Bulletin 167.



Furnace Fan Motors

—In 12, 16 and 19-in. sizes. Placed in cold air intake of warm air furnaces, will raise efficiency of furnace and keep living rooms comfortably warm. Spring and rubber mounted for noiseless operation. Described in Bulletin 166.



Wagner Fans

Desk and Wall Fans—8, 10, 12 and 16-in. sizes; oscillating and non-oscillating; three-speed switch; for direct or alternating current. Described in Bulletin 178.



Ventilating Fans—12 and 16-in. sizes, for alternating or direct current, in different cycles and voltages. Intended for walls or partitions, to exhaust smoke, dust, odors, bad air. Described in Bulletin 178.

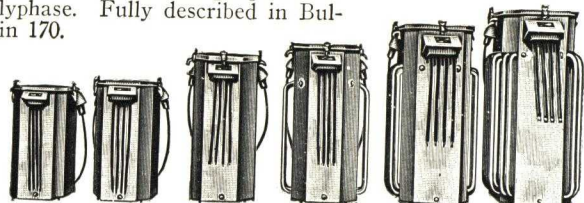
Ceiling Fans—36 and 52-in. blade sweep, for alternating or direct current, 50 and 60 cycles. Described in Bulletin 178.



Wagner Transformers

Distribution Transformers—Single-phase and three-phase, pole and subway types—all frequencies, voltages up to 132,000, 1.5 to 500 kv-a. Of very latest design and construction—copper-bearing electrically welded steel tanks; wet process bushings; dehydration under vacuum; mica, varnished muslin and press board insulation; structural steel end plates. Fully described in Bulletin 172.

Power Transformers—Up to and including 10,000 kv-a. and 132,000 volts—single-phase or polyphase. Fully described in Bulletin 170.



SQUARE D COMPANY

INDUSTRIAL CONTROLLER DIVISION

MILWAUKEE, WIS.

SWITCH AND PANEL DIVISION: DETROIT, MICH.

PORCELAIN DIVISION: PERU, IND.

AFFILIATED WITH

SQUARE D COMPANY, LTD., Walkerville, Ont.

DIAMOND ELECTRICAL MFG. CO., LTD., Los Angeles

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Automatic Electric Motor Control

The Industrial Controller Division—"I-C"—of the SQUARE D COMPANY specializes in the manufacture of automatic starters and controllers for electric motors. Push button control, with low voltage and overload protection, is the modern standard.

The I-C line is complete for industrial applications. A-c. and d-c. starters and controllers; compensators; magnetic contactors; reversing contactors; dust-tight, water-tight and explosion proof apparatus.

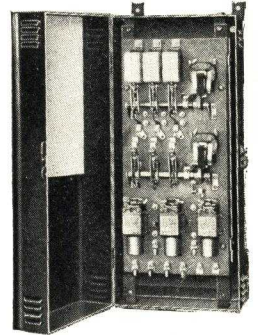


A-c. Automatic Starters Reduced Voltage Type

Built either in the primary resistor or auto transformer, compensator types. Both give remote control, time limit acceleration, low voltage and overload protection.

Maximum ratings 50 hp., 220 volts or 100 hp., 440-550 volts.

Also manually operated compensators.



A-c. Manual Starters

Push button operation. Overload protection by thermal overload relays, which are reset from the stop button. Opens all lines to the motor. Small dimensions. Built in sizes up to 5 hp., 220 volts or 7½ hp., 440-550 volts polyphase.

Also built for single phase.

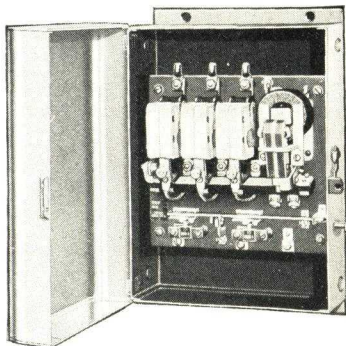
For damp or dusty locations, these starters are built with cast-iron, dust-tight and water-tight enclosures.

Two starters, mechanically interlocked and mounted in one cabinet, may be used as a controller for a two-speed squirrel cage motor or for reversing service.

Special Control Applications

A complete line of contactors, reversing contactors, relays, timing relays, magnetic and thermal relays, resistors and switches makes it practical for the Industrial Controller Division to design and manufacture a wide variety of special control equipment.

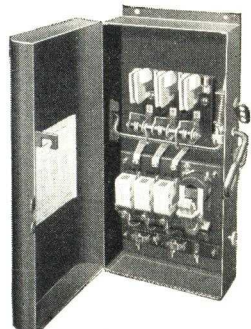
Some applications are hoists, conveyors, machine tools, pump panels, heating and ventilating equipment.



A-c. Automatic Starters

Complete automatic control for motors which may be thrown directly across the line. Operation from push button control stations or from automatic devices such as float, pressure or limit switches or thermostats. Low voltage protection and thermal or magnetic overload protection. Built in sizes up to 50 hp., 220 volts or 100 hp., 440-550 volts.

Also built with dust-tight, water-tight or explosion proof enclosures. These starters can be used for the primary circuit of slip-ring motors.



A-c. Combination Starters

A line voltage automatic starter mounted in a cabinet with a motor circuit disconnect switch. The switch is externally operated and interlocked with the door of the cabinet.

Can be supplied fused or non-fusible.

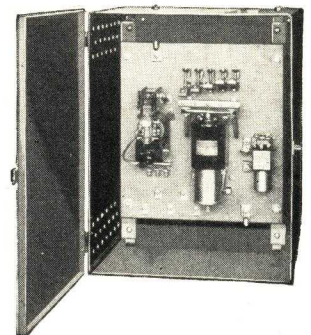
This combination is compact and reduces installation and wiring costs. The automatic starter gives push button control, low voltage and overload protection. Maximum ratings 25 hp., 220 volts or 40 hp., 440-550 volts.

D-c. Automatic Starters

Push button control, time limit acceleration, low voltage protection, with or without overload protection.

The accelerating period is adjustable to meet the starting load conditions.

Built in sizes up to 60 hp., 230 volts.



Auxiliary Control Devices

A complete line of float switches, pressure and vacuum switches, limit switches and push button control stations.

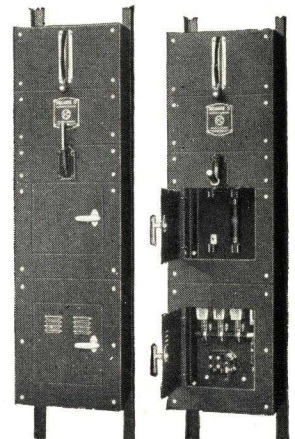
Unit Type, Control Panels

In place of the old type slate or marble switchboards, Square D offers control panels built up from standard control units.

They are lower in cost and can be added to or rearranged at minimum expense.

The illustration shows two sections of a panel with automatic starter, line switch and transfer switch.

The panels are dead front.



CUTLER-HAMMER, INC.

Pioneer Manufacturers of Electric Control Apparatus

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1293 West St. Paul Avenue, MILWAUKEE, WIS.

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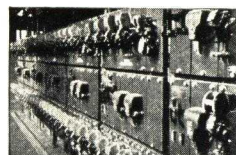
Experts in Special Control Equipment

As pioneer manufacturers of electric control, C-H Engineers bring you the knowledge and skill of over 30 years' experience in solving your special control problems. This assures you utmost in efficiency and economy when you bring your special control problems to C-H. These pages illustrate and describe briefly only a few



typical Cutler-Hammer products. Complete detailed information will be gladly supplied on these as well as other items not shown—upon request to the nearest C-H Office.

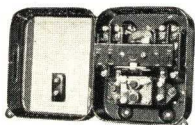
Complete catalogue gladly sent on letter-head request.



A-C. STARTERS

Bulletin 9586 Across-the-Line ("X") Automatic Starter

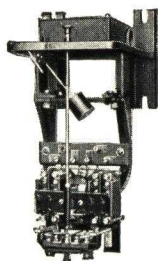
For standard or high-torque and single-phase squirrel-cage motors, 3 to 175 hp. Inverse time-limit, thermal overload relays protect motor—reset from outside case. Push-buttons in cover or separate. Tests prove starter life good for millions of operations. Small, compact, fool-proof. Weatherproof type available in all sizes.



Standard Starter,
P.B. in Cover



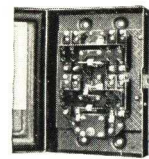
Weatherproof,
Dust-tight



Explosion-proof
Oil-immersed
(Tank Removed)

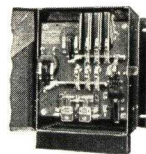
This type made in
all sizes

locked. Furnished in the following constructions: Horizontal (contactors side by side); Vertical (contactors mounted one above the other); Back-to-Back; also open type for hoist service. With or without thermal overload protection. Sizes up to 50 hp.



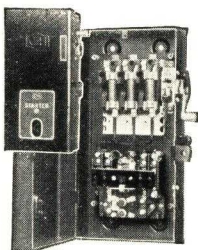
Reversing Vertical
Construction

Bulletin 9605 Primary Resistor Automatic Starter with Mercury Timer



Time-limit acceleration through C-H Mercury Timer insures trouble-free, constant timing of accelerating period. Single-step primary resistor. Three-pole contactor. Thermal overload protection. For squirrel-cage induction motors up to 30 hp. Also auto-transformer and secondary resistor types for larger horsepower applications.

Bulletin 9589 "X" Automatic Starter with Disconnect Switch



Starters are identical with Bulletin 9586 plus an outside-operated disconnect switch. For starting a-c. motors up to 50 hp. or as a primary protective panel when used with a secondary resistor starter for slipping motors. Fused or unfused types; with or without test jacks.

Bulletin 9595 Reversing ("X") Line Automatic Starter

These reversing starters are the 3-pole type with contactors mechanically inter-

Manual Starters

Available in many designs. A few popular types are illustrated. Bulletin 9101 is extremely compact, yet includes thermal overload protection. It is pushbutton operated with single-pole, double-break contacts and is used for fractional horsepower, a-c. and d-c. motors. Bulletin 9115, across-the-line type, 3- or 4-pole with thermal overload protection is used with motors up to 7½ hp. Bulletin 9141 Auto-Transformer type is used with polyphase squirrel-cage motors up to 150 hp. Has thermal overload protection and standard drum-type contacts, oil-immersed.



Bulletin
9101



Bulletin
9115



Bulletin
9141

A-C. AND D-C DRUMS, RELAYS AND CONTACTORS

Standard and Explosion-proof Drums

Standard enclosed types made for both a-c. and d-c. motors up to 750 hp. Rugged construction, straight-line, non-stubbing fingers, auxiliary interlock contacts. Conduit box for easy wiring. Radial lever, rope wheel, straight-line lever, rear-of-board bevel gear and duplex drives. Where explosive gas or dust may be present, Explosion-proof type provides the same efficiency and operating features as Standard C-H Drums—plus complete safety. C-H drums also furnished in skeleton types for building into machines.



Bulletin
9410
Standard

A-c. and D-c. Relays

Bulletin 6001 lists a complete line of relays for d-c. and Bulletin 9575 for a-c. single and double-



pole types with silver-to-silver contacts, either normally open or normally closed and rated up to 30 amps.

Small and compact. Operate on very low coil wattage. With or without enclosing case.

A-c. and D-c. Contactors

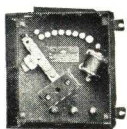
Standard contactors are available in 1-, 2-, 3- and 4-pole types—with or without enclosures. Sizes up to 480 amps., a-c.; Bulletin 6002 and 6005 cover d-c. types; Bulletin 9592 covers a-c. types. Designed for continuous duty. For remote control of lighting and power circuits, for use with drum control, etc.



Bulletin 9592
A-c. 3-pole
Type

D-C. STARTERS

Manual Starters and Regulators

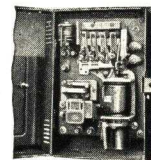


D-c. Manual Starters and Speed Regulators can be obtained in standard, heavy-duty and compound types—also with knife switch and fuses, or circuit breaker protection.

Also furnished in Multiple Switch types for heavy-load conditions.

Automatic Starters

D-c. Automatic Starters are available in Across-the-Line and Counter E.M.F. types for small motors up to 2 hp. and Time Limit types up to 200 hp. With or without thermal overload protection, knife switch and fuses or circuit breaker. Open or enclosed panels.



Bulletin 6106
Time Limit
D-c. Starter

MASTER STATIONS, FLOAT AND PRESSURE SWITCHES AND ACCESSORIES

Pushbutton Master Stations

There is a Pushbutton Master Station in the complete C-H Line for every need and every industry. Those shown below are just a few typical stations of the many listed in Bulletin 10250. C-H Stations are noted for their easy operation, visible markings and heavy-duty construction for long life. They can be furnished in a great variety of combinations and functions—for starting, reversing, speed control, etc., and in standard, dust-tight, weatherproof and waterproof enclosures.



With
Signal
Light



Standard
2-button
Light Duty



Dust-tight
Oil
Immersed



Dust-tight
Weather-
proof



Water-
tight

Miscellaneous Accessories

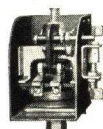
There are a-c. and d-c. Accessories for every need. Pressure Regulators in single and double-pole types for pressures above or below atmospheric, for tank or sump pump service, etc.

The line includes phase failure devices, overload protective devices—pushbutton, foot and lever-operated master switches—plugging relays, limit switches, centrifugal governors, etc.

Most C-H Accessories can be used as starting devices for smaller horsepower applications or as pilot devices in con-

nection with suitable automatic starters for the larger horsepower installations.

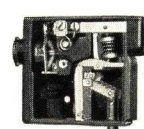
C-H Accessories are known for their trouble-free operating mechanisms, long life and compact design. They are easy to wire and simple to adjust.



Bulletin 10006
Pressure
Switch



Bulletin 10036
Float
Switch



Bulletin 10038
Float
Switch



Bulletin 10316
Limit
Switch

Standard and Dust-tight Safety Switches

C-H Safety Switches are built in a complete range of sizes for all applications, and include such features as quick-make and break, double-break contacts, self-aligning blades, non-current carrying hinges, etc. Weatherproof types for all outdoor requirements.

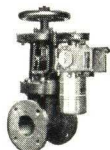
Explosion-proof designs in a complete range of sizes for use in explosive atmospheres insure safety to operators and eliminate fire hazards. Standard switches in sizes up to 1200 amps.



Bulletin 4102
Typical of C-H
Dust-tight
Weatherproof
Types

SPECIAL EQUIPMENT

Motor-operated Valve Control Units



For Valves
3/4 in. to 72 in.

Advantages are convenience, speed, safety and dependability. This system brings every valve in the plant under instant pushbutton control, responsive to the touch of a finger. All valves, regardless of size, location or condition are operated in a fraction of time required by hand. Provides positive protection in emergencies. Bulletin 809 for valves 3/4 in. to 6 in.; Bulletin 810 for valves up to 72 in.

Field Rheostats and Resistors

Bulletin 11106 Plate type Rheostats for small, low-voltage generators. Bulletin 11111 Plate type for general use. In addition there is a wide variety of Unit type Resistors, Grid Resistor Banks, etc.—all in an extensive range of capacities.



Bulletin 11106
Field Rheostat

Space Heaters and Immersion Heaters

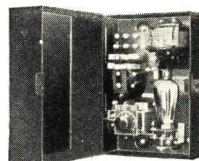
Bulletin 15510 Improved C-H Space Heater is ideal for countless applications. Capacity, 500 watts. Used singly, in pairs or in groups. Improved refractory insulation greatly increases heating efficiency. Bulletin 15003 Conduction Heaters

for machine and general industrial use. C-H Bulletin 15003 Tubular Immersion Heaters for water and oil heating.



Bulletin 15510 Space Heater

Electronic Control Apparatus

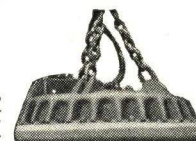


Bulletin 13101
Tube Timing Welder
Control

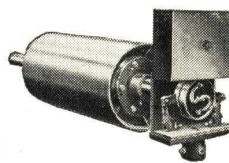
Electronic Tube Control is proving ideal because of its instantaneous response to extremely small transfers of energy. Used as a rectifier (a-c. to d-c.); as a phase failure and reversal device; in welder service for unusually accurate timing; also as a Photo-Cell Control (Bulletin 13111) for countless applications where it operates in response to the interruptions of a beam of light.

Some Other C-H Equipment

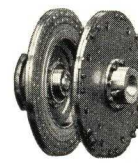
Control and Accessories for Elevators, Marine Service, Fire Pumps, Printing Equipment, Mill Duty, etc. Electrical Specialties, Theater Dimmers, Battery Charging Apparatus, Gas Measuring Devices, "Thermoplax" Moulded Insulation, etc. Literature supplied by nearest C-H Office.



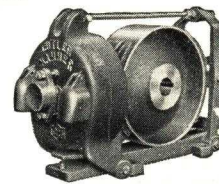
**C-H Lifting
Magnet**



C-H Separator Pulley



C-H Clutch



C-H Brake

THE TRUMBULL ELECTRIC MFG. CO.

PLAINVILLE, CONN.

LUDLOW, KY.

BRANCH SWITCH, SWITCHBOARD AND PANELBOARD FACTORIES

PACIFIC DIVISION: LOS ANGELES, CAL.; SEATTLE, WASH.
DRENDELL-TRUMBULL ELECTRIC MFG. CO., SAN FRANCISCO, CAL.

SALES OFFICES

NEW YORK, N. Y., 60 E. 42nd Street
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CHICAGO, ILL., 564 West Monroe Street
Detroit Branch, 415 Brainard Street
ATLANTA, GA.

SAN FRANCISCO, CAL., 260 Van Ness Avenue, So.
BOSTON, MASS., 1002 Statler Building

THE "CIRCLE T" LINE



venience outlet for power in industry); CONTROLITE (the theatre control board); CONVERTI-FUSE (the convertible power panel); "F.O.I." (front operated interlocking) dead front distribution board.

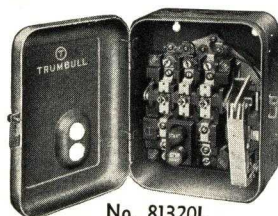
Catalogues and bulletins listing "Circle T" products gladly sent on request.

INDUSTRIAL SWITCHES; MOTOR CIRCUIT SWITCHES; ENTRANCE SWITCHES; MAGNETIC and MANUALLY OPERATED MOTOR STARTING SWITCHES; METER SERVICE SWITCHES; TUMBLER SWITCHES; OPEN KNIFE SWITCHES; SPECIAL SWITCHES.

PANELBOARDS; SWITCHBOARDS; BUSS-WA (the copper bar distribution system); FLEX-A-POWER (the con-

Magnetic Motor Starting Switches

Compact magnetic switches for local or remote control with time limit overload and undervoltage protection. Furnished either self-resetting or hand reset after trip on overload.



No. 81320L

Equipped with local control push button stations as a part of the switch or separate push button stations for remote control switches.

Relay heaters ranging from 8 to 60 amps. provide overload protection on the "M-25" type. On the "M-7½" switches, relay heaters ranging from ½ to 20 amps. provide overload protection.

Thermostatic trip is reset by the start button after an interval of two minutes for relay heaters to cool when the switch has opened on an overload.

Relay heaters are easily interchanged.

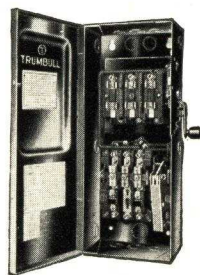
Moving contacts bridge the gap between the line and load side of the switch through stationary contacts in each leg. A moulded composition barrier between contacts shields each from the other so that maximum loads can be broken without the possibility of a flashover.

H.P. RATINGS FOR MAGNETIC MOTOR STARTING SWITCHES

Volts, a-c.	Type "M-7½"				Type "M-25"			
	110	220	440	550	110	220	440	550
Polyphase.....	3	5	7½	7½	7½	15	25	25
Single phase.....	1½	3	5	5	3	7½	10	10

Magnetic Combination Switches—Types "M-7½" and "M-25"

A combination of a magnetic switch for either local, remote, or automatic control, wired to a manually operated fusible or no fuse motor circuit switch in one box. Listed as standard by the Underwriters' Laboratories, Inc., for a manually operated disconnect switch ahead of a magnetic switch with thermal overload protection. Both switches are capable of breaking the stalled rotor current of motors for which rated and may be readily removed from the box for wiring by loosening the mounting screws. H.p. ratings are same as above.



No. 81320-R3

Type "A" Safety Switches

Supplied either single or double throw, in fusible or no fuse types and will break full load at listed ratings.

These quick positive make and quick break switches have an interlocking safety cover. Switches are made of milled foot block construction with built-up contact jaws sweated and pinned into the foot blocks on the larger sizes and swaged into the foot blocks on the smaller sizes. Rated 2, 3 and 4 poles, 30 to 2400 amps. at 230 and 575 v. a-c. and 250 and 600 v. d-c.



No. 36362

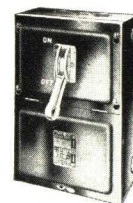
Type "R.B." Safety Switches

Revolutionary in switch construction, these new quick make and quick break, *receding blade* switches will break full rated load under frequent operation with long life. Path of current does not pass through any hinged, soldered or riveted connections which makes a stronger and more compact switch unit and reduces voltage drop.

A new method of breaking current from extended arc breaking tips prevents pitting and scarring on contact surfaces which burnish themselves and retain a perfect contact area.

A fuse clamping device is regularly supplied on all Type "RB" Switches, 30-800 amperes. Switches provided with interlocking cover.

Available either side or front operated, in fusible and no-fuse types.



No. 64362

Type "C" Switches

Externally operated, single throw, quick positive make and quick break switches in no fuse and fusible types.

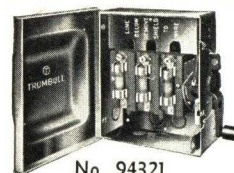
High class punched clip construction is used, giving maximum electrical and mechanical strength for this type of design.

The box cover, however, does not have the safety interlocking feature of the Type "A" line.

These switches are available 2 to 5 poles, inclusive, in 230 v. a-c. and 250 v. d-c. ratings, and 3 and 4 poles at 575 v. a-c.

Rotor Movement (Type "R.M.") Switches

A revolutionary design in safety switch construction in both fusible and no fuse types. Has double break blade construction with rotor movement. This design results in a very compact switch for breaking full rated loads. When switch is opened, blades are thrown into deep, narrow slots in the base, cooling and snuffing out the arc. In 2, 3 or 4-pole switches for 30 and 60 amp. and 250 or 600 v. in either drawn steel or cast iron boxes. Also available in 2-position motor starting types with the fuses shunted in the starting position.



No. 94321

Thermostatic Manual (Type "T.M.") Motor Starting Switches

These switches provide thermal protection against overload or damage due to phase failure. Externally operated by simple "on" and "off" movement of the handle. Overload in any phase trips the entire switch. To reset, just throw the switch "on" after the thermal element has cooled. Handle returns to "off" when switch trips from an overload.

Switches will break stalled rotor current at listed ratings. Ampere capacity regulated by interchangeable heater units, ½ to 20 amp. Double butt wiping contacts close under pressure.

Type "T.M.-2" front operated, max. rating 2 hp. at 110-550 v. a-c. polyphase. Type "T.M.-7½" side operated, max. rating 7½ hp. at 575 v. a-c. polyphase.



No. 91367

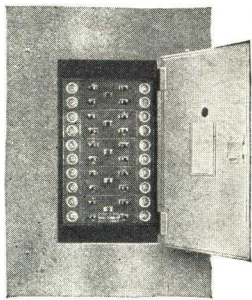
Unit Panelboards

Trumbull "Circle T" Panelboards can be furnished in a number of various types suitable for all recognized service; and with either tumbler switches and fuses in the branches, or fuses only, or of the no-fuse, automatic circuit breaker.

Four types of mains are provided:

- (1) Lugs only.
- (2) Converti-Fuse switch mains.
- (3) Type "R.B." switch mains.
- (4) Circuit breaker mains.

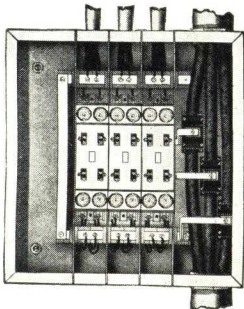
See Catalogue 15 for detailed description and listing or the Trumbull Panelboard Manual, which may be had on request.



NTP 320L
Safety type

The Hixley Panel

A further refinement of Trumbull panelboard construction is found in the Hixley type of cabinet. In normal wiring practice, the number of wires in any individual conduit is limited to nine. In the case of a panelboard cabinet gutter, there is no restriction on the number of wires; and in many instances this condition constitutes a *fire hazard*. With the Hixley compartment construction, congestion of wiring is eliminated. Send for the Hixley Bulletin which describes this radical improvement in panelboard cabinet construction.

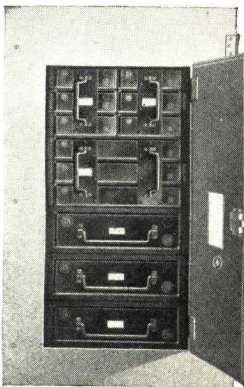


Converti-Fuse Panels

As the name implies, Converti-Fuse Panels have been developed to provide a safe and economical dead front panel with the added feature that the panel is convertible for either larger or smaller size fuse gaps.

This dead front distribution panel not only facilitates fuse replacements but also repairs or extension to the line.

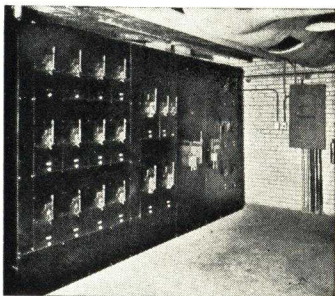
Completely described in Bulletin No. 97.



"F. O. I." (Front Operated Interlocking)

Switchboard of dead front steel construction developed to provide an economical switchboard which will provide full safety to the operator. The individual switches are of

"Circle T" design being of the parallel break, double break and quick break construction. An interlocking door is provided over the fuse compartment so that access to the fuses cannot be had until the switch is in the "off" position. If desired, this board may be arranged so that all wiring is accessible from the front. This feature is valuable for installations where space is limited. All of these features are described in the "F. O. I." Bulletin No. 88.



"F.O.I." Switchboard in a Large
Department Store

"R.B.I." (Receding Blade Interlocking)

In addition to the "F. O. I." type of switchboard described, there is also available the "R. B. I." type of board utilizing the cubicle form of construction.

At the right is illustrated a two-panel switchboard of this type. The switch units possess all of the features of the "F. O. I." and in addition to their being "quick-break" are "quick-make" as well. A new type of fuse holder called "Vystipe" is also a valuable feature not commonly found in competitive units.

The construction of "R.B.I." switchboards is adaptable to meet any special or unusual requirements.

Complete information may be obtained at any of our sales offices, and it is desirable that you have our "R. B. I." Switchboard Manual in your files. This Manual contains not only information on "R. B. I." but useful data applying to switchboards in general.



Buss-Wa—The Copper Bar Distribution System

The Buss-Wa Distribution System has been developed to provide a safe and economical means of running power or light feeders without the use of conduit and wire.

This feature is worthy of note, particularly in the large sizes of feeders when multiple wires per pole would be necessary.

Briefly, this material consists of a heavy gauge U-shaped housing into which is inserted the necessary buss bars held in place by means of special ebony asbestos supports. A cover is provided along its entire length and smaller covers, readily removable, are located at the joints. This provides a means for inspection.

Because of its design, taps or fittings can be readily attached, providing a neat method for tapping off to transformers or other equipment.

Adaptable for both indoor and outdoor service.

In many instances the use of Buss-Wa will show a considerable saving over conduit and wire, particularly when the amperage capacity to be transmitted is large. Information about Buss-Wa is available at all of our branch sales offices.

Flex-A-Power

Flex-A-Power is similar in construction to Buss-Wa except that contacts are provided at predetermined intervals into which plugs may be inserted providing taps for motors or other equipment. Particularly adaptable for branch runs, and because of its flexibility is known as "The Convenience Outlet for Power in Industry."

"Controlite"

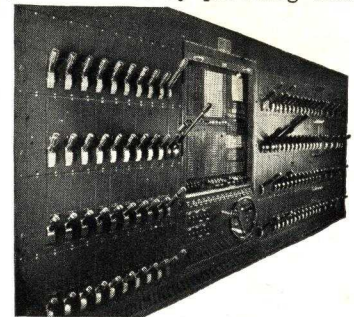
"Controlite" is a combined switchboard and interlocking dimmer bank designed to give ideal theatre lighting control at reasonable cost.

Long study of theatre lighting problems has shown that good lighting effects can only be obtained by providing ease of dimmer and switchboard operation.

"Controlite" may be provided with control refinements commonly required—such as slow motion cross control, advance set-up and multi-preset remote control.

"Controlite" is a complete switchboard and a complete dimmer bank combined, making a very compact installation.

It is built and shipped as a complete self-contained unit. Upon arrival on the job it is only necessary to connect line and load wires.



"Controlite" Theatre Control Board
With Multi-preset System

WESTINGHOUSE ELECTRIC & MFG. COMPANY

EAST PITTSBURGH, PA.

WESTINGHOUSE SALES OFFICES

ABILENE, KAN.	COLUMBIA, S. C.	HAMMOND, IND.	NIAGARA FALLS, N. Y.	*†SAN FRANCISCO, CAL.
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*†CLEVELAND, OHIO				YORK, PA.

*Service Shops located also in these cities, and at Appleton, Wis.

HONOLULU, T. H., The Hawaiian Electric Co., Ltd.—Agent

*Warehouses located also in these cities, and at Marshall, Tex.

WESTINGHOUSE AGENT-JOBBER

ABILENE, KAN., Union Electric Co.	EVANSVILLE, Westinghouse Elec. Sup. Co.	PHOENIX, ARIZ., Westinghouse Elec. Sup. Co.
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BOSTON, Wetmore-Savage Elec. Sup. Co.	LOS ANGELES, Westinghouse Elec. Sup. Co.	SAN FRANCISCO, Westinghouse Elec. Sup. Co.
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COLUMBIA, S. C., Westinghouse Elec. Sup. Co.	NEW HAVEN, Westinghouse Elec. Sup. Co.	TOLEDO, Westinghouse Elec. Sup. Co.
COLUMBUS, OHIO, Hughes-Peters Elec. Corp.	NEW ORLEANS, Electrical Supply Co.	TRENTON, Westinghouse Elec. Sup. Co., Inc.
DALLAS, Westinghouse Elec. Sup. Co., Inc.	NEW YORK, Times Appliance Co., Inc.	TULSA, Westinghouse Elec. Sup. Co.
DENVER, The Mine & Smelter Sup. Co.	NEW YORK, Westinghouse Elec. Sup. Co., Inc.	UTICA, Westinghouse Elec. Sup. Co., Inc.
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EL PASO, The Mine & Smelter Sup. Co.	PHILADELPHIA, Westinghouse Elec. Sup. Co.	WORCESTER, Wetmore-Savage Elec. Sup. Co.
ERIE, Star Electrical Co.		YORK, Westinghouse Elec. Sup. Co.
		YOUNGSTOWN, The Moock Elec. Supply Co.

Some Westinghouse Products

Air Conditioning Equipment
Appliances (Electric), Domestic, Hotel and Restaurant
Arc Welding Equipments
Arresters, Lightning, all types
Autostarters
Aviation Lighting Equipment
Babbitting Outfits: Babbitts, Solder
Battery-charging Equipment (Rectifiers, Rectifiers, Rectox, Motor Generators)
Bearings: Axle, Armature, Journal, Roll Neck
Beer Coolers
Blocks: Fuse, Switch Terminal
Bonds, Rail
Breakers, "De-ion"
Breakers, Sentinel
Brushes
Busbars (Copper) and Supports for Catenary Material
Circuit-breakers: Air and Oil
Clamps: Guy, Mine and Trolley
Coils, all kinds
Coffee Urns and Percolators (Electric)
Compounds: Insulating, Soldering
Condensers: Electric and Steam
Connectors (Electric), Clip-type Safety
Control: Desks, Equipment and Panels
Controllers: Motor and Electric
Converters, Synchronous Rotary
Crossovers, Trolley
Cut-outs: Fuse, Transformer
Demand Meters, Watthour
Ejectors: Air
Fabrics and Papers (Insulating)
Fans (Electric), all kinds
Floodlights
Frequency-changers
Frogs, Trolley
Furnaces (Electric), Industrial

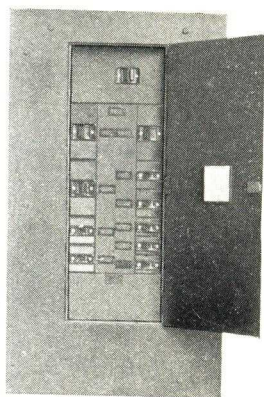
Fuses, Power
Gas-Electric Sets
Gearmotors
Gears and Pinions, "Micarta" and Steel
Generators (A-C. and D-C.)
Glue Pots (Electric)
Griddles (Electric)
Hangers: Cut-out Trolley Wire
Headlights, Locomotive
Headlights: Locomotive and Mine
Heaters (Electric), all kinds
Indicators: Speed and Thermal
Inserts, Concrete Adjustable
Instruments (Electrical)
Insulators, all kinds
Lamps, Mazda
Light and Power Plants, Small
Lighting Equipment, for every use
Lighting Systems, Complete
Line Fittings, Transmission
Line Material
Linestarters
Locomotives (Electric, Gas-electric, Oil-electric)
Luminaires, Magnalux, Sollaie and Sollux
Meters (Electric)
Micarta Products
Motor-generators, Synchronous
Motor Starters, Safety
Motor Starting Switches
Motors, all kinds (Thermoguard)
Network Protectors and Transformers
Oil, Insulating
Oil Purifying and Testing Outfits
Oscillographs and Osiso
Ovens (Electric): Baking, Industrial
Panelboards, all kinds (Nofuze)
Phototroller
Pipe Fittings for Structures
Poles: Transmission and Trolley

Potheades
Railway Coach Fans and Equipment
Ranges: Electric and Fuel-electric
Reactors, all kinds
Rectifiers, Mercury
Reflectors, all kinds
Refrigerators, Electric
Regulators (Electric)
Relays for every purpose
Resistors and Resistance Units
Rheostats: Starting and Field
Sandwich Toasters
Signal Arresters and Transformers
Solar Glows: Floor and Wall Mounting
Speed Reducers
Starters and Controllers (Motor)
Stokers, Underfeed
Stoves: Table and Disc
Street Lighting Equipment
Substations (Automatic and Non-automatic)
Substations and Switchhouses, Outdoor
Switchboard Panels: Steel and Slate
Switches, all kinds
Switchgear and Metering Equipment (Outdoor)
Switchgear Equipment (Automatic)
Tachometers, Railroad
Tapes, all kinds
Theater Switchboards
Toasters, Turnover
Transformers, all kinds
Trolley Equipment, Line Material
Turbine-generators and Turbines
Ventilating Outfits
Water Coolers
Water Heaters, all kinds
Wattmeters
Wire Splicers, Trolley
Wiring Devices
Yokes, Strain

For Westinghouse Products in Other Sections, see Manufacturers' Index

Panelboards

Westinghouse builds a complete line of Nofuze panelboards to meet the lighting requirements of industrial plants, office buildings and hotels where reliable lighting control is desired. Circuits are controlled by "De-ion" circuit breakers in capacities from 15 to 600 amperes and voltages up to 600. Fuses are entirely eliminated.



Nofuze Convertible Distribution Panelboard

These panelboards have boxes of standard widths and are so constructed that the unit sections of all panelboards are interchangeable.

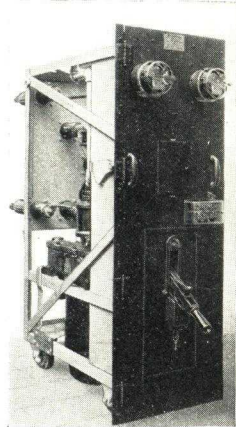
Full information on Westinghouse Nofuze panelboards is given in Catalog 2246. A copy can be obtained from the nearest Westinghouse office.

Switchboards

The Westinghouse Company, through its long manufacturing experience and corps of trained engineers, is in a position to produce superior switchboard equipment for the control, distribution and regulation of electric power.

Many types of standard panels are available for prompt shipment, which are listed in the Westinghouse General Catalog.

Switchboards of the Nofuze, semi-automatic and full automatic types, which are now being extensively used, are also available.



Truck-type Unit

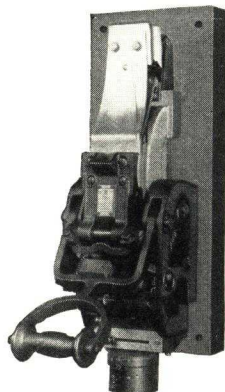
Types are available for the wide range of switching applications and are equipped with circuit breakers of our well proven design.

Indoor Service	Outdoor Service
Truck-type	Switch houses
Metal-clad	Oil filled
Cubicles	

Type CL Air Circuit Breakers

Permanence of appearance has been obtained by giving all copper parts a satin finish which retains its lustre without polishing. The framework has been reduced to the simplest, neatest form consistent with strength. This construction allows easy access to all breaker parts.

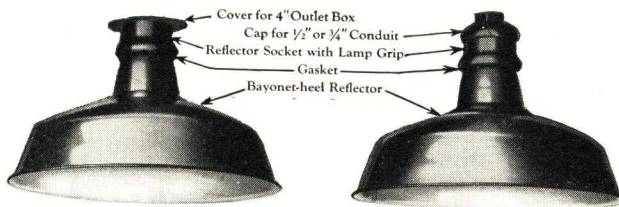
Send for Catalog 223A.



CL Carbon Circuit Breaker

2000-amp., single-pole, with inverse-time-limit overload device

RLM Dome Reflectors—Bayonet-Heel



RLM Dome Type

The best illumination for industrial purposes can be obtained by use of Westinghouse Glassteel Diffusers and RLM Dome Reflectors.

The Westinghouse line of industrial lighting equipment also includes standard bowl, elliptical angle, symmetrical angle, and shallow dome reflectors. They can all be installed easily in a few minutes because of the bayonet-heel reflector—socket fixtures. These fixtures may be suspended on 1/2 or 3/4-in. conduit or directly from 4-in. outlet box.

Send for Catalog 219-A.



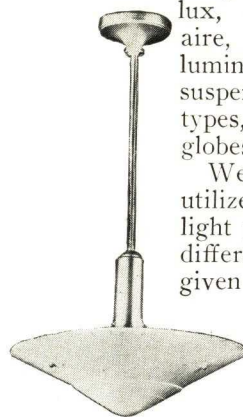
Glassteel Diffuser

Commercial Lighting Fixtures

For lighting offices, where glareless shadow-free illumination is required, Westinghouse makes Magnalux, Sollux, Lunlux, Sollaire, Lunaire, and Sollite Luminaires. These luminaires are available in ceiling, chain suspension, and semi-rigid suspension types, with either plain or decorated globes.

Westinghouse equipment is designed to utilize the highest possible percentage of light per watt generated by lamp. The difference in wattage consumption for a given intensity over a period of years between good and poor equipment represents a cost many times more than the difference in cost of good equipment. Keep this fact in mind.

Send for Catalog 219-B.



Magnalux

Floodlights

The Westinghouse complete line of floodlighting equipment is fitted to accomplish any prescribed lighting effect and to maintain that effect from year to year. These floodlights come in sizes with 8, 10, 12, 14, 16, 20, and 24-in. reflectors, and may be equipped with clear or colored and rectangular or stippled diffusing lenses.

They are made of cast silicon-aluminum, sheet aluminum, sheet copper, or sheet steel. The unventilated type of housing is used, making the floodlights dustproof and weathertight.

Either silvered glass or chromium-plated reflectors.

Send for Catalog 219C.



Type CAG-14 Floodlight

STEEL AND TUBES, INC.

ELECTRICAL DIVISION

Manufacturers of Steeltubes—the Modern Threadless Rigid Conduit
224 East 131st Street, CLEVELAND, OHIO

A UNIT OF REPUBLIC STEEL CORPORATION

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BALTIMORE, MD., 912 Garret Building
T. D. Mitchell
BOSTON, MASS., 250 Stuart Street, Consolidated Building
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James E. Whitfield

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Building
H. L. Huxster
ST. LOUIS, MO., 5067 Durant Avenue
Alfred A. Bohn
SAN FRANCISCO, CALIF., 718 Rialto Building
H. H. Benfield
SEATTLE, WASH., 3001 Smith Tower
H. H. Walker

Steeltubes answers the problem of economical construction without compromise of quality. It is electrically welded steel tubing—strong, rigid, threadless—protected against corrosion by a smooth galvanized exterior finish, and with a glass-like inside finish of baked-on black enamel. It is lighter in weight than old-style threaded conduit, yet it affords the same degree of mechanical and electrical protection.

Steeltubes costs less to buy and less to install. It is easy to cut and bend, and requires no



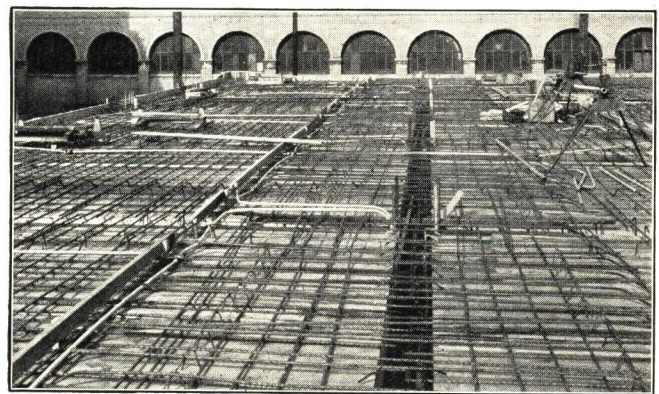
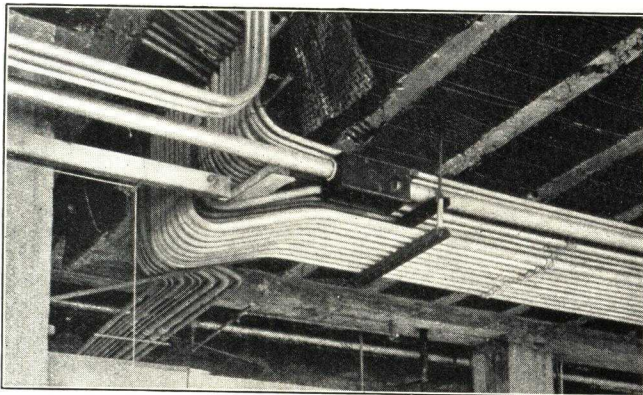
DIMENSIONS AND WEIGHTS OF STEELTUBES

Size, in.	Approx. wt. per 1000 ft. less couplings, lbs.	B.W. gauge	Diameter, in.	
			Internal	External
$\frac{3}{8}$	254	19	.493	.577
$\frac{1}{2}$	321	19	.622	.706
$\frac{3}{4}$	488	18	.824	.922
1	711	17	1.049	1.163
$1\frac{1}{4}$	985	16	1.380	1.508
$1\frac{1}{2}$	1141	16	1.610	1.738
2	1470	16	2.067	2.195

threading and fewer tools. Can be straightened and rebent just as easily. Joints are quickly made—three simple types of fittings adapt Steeltubes to any job.

Sales records prove the wide acceptance of Steeltubes—more than 40,000,000 feet installed. It has been given broad code and Government approval.

You can specify Steeltubes for all open and concealed work (except in cinder fill) in any standard size from $\frac{3}{8}$ to 2-in. Stocked by electrical supply houses in all large jobbing centers.



COUPLINGS AND CONNECTIONS FOR STEELTUBES

Steeltubes Fittings provide tremendous gripping power, and assure tight connections. They are protected inside and out by cadmium plating and special galvanizing. Steeltubes can

be used with all ordinary outlet or switch boxes and threaded or threadless conduit fittings.



Coupling with
Wire Spring



Watertight Cou-
pling with Brass
Ring



Coupling
with Steel
Gland



Steeltubes Adapter
for Threaded Con-
duit Fittings



Box Connector
with Wire
Spring



Watertight Con-
nector with
Brass Ring



Box Connector
with Steel
Gland

NATCO CLAY CONDUIT FOR CABLE PROTECTION

MANUFACTURED BY
NATIONAL FIREPROOFING CORPORATION

GENERAL OFFICES
Fulton Building, PITTSBURGH, PA.

For Natco Structural Clay Tile, see page numbers in Manufacturers' Index

NATCO CLAY CONDUIT

For Permanent Cable Protection

Outstanding Advantages of Natco Conduit

Cable Protection—

Protects cables against fire, corrosion, vibration, electrolysis, mechanical injury or interference and chemical attack.

Permanence—

Permanent in character and permanent in form, Natco Conduit will not soften, swell, deform, crack or abrade, rot or decay, weaken, collapse or disintegrate on exposure to heat, moisture, steam, freezing or chemical attack, and is particularly adapted to wet or corrosive ground conditions or to alkaline or cinder fills—now demonstrated in 40 years of responsible service.

Non-Corrosive—

Natco Clay Conduit, inert, insoluble and chemically neutral, is free from corrosive organic acids or compounds, free from caustic lime or alkalis that might injure the cable sheath.

Non-metallic—

Being non-metallic in character, Natco Conduit is proof against rust, oxidation and electrolysis.

Strength and Structural Advantages—

Natco Conduit, of high compressive strength, wet or dry, is inherently a structural unit as well as a conduit, and consequently becomes an integral and useful part of any masonry structure. In walls of buildings for riser cables, in cable vaults, under floors of power stations or industrial shops, in walls of vehicular tunnels or service tunnels, in floors of highway bridges or viaducts, in canal locks, marine terminals or submarine crossings, in railroad subways, viaducts, retaining walls or terminal structures, in airports, in municipal fire and police alarm systems, in hospitals, schools and universities, penitentiaries, navy yards, government buildings, Natco has a wide and useful application, and at practically no additional cost over other masonry materials.

Important, too, is the fact that Natco Conduit incorporated in masonry structures affords the greatest strength per unit of displacement. It occupies little space for it requires no separation. Besides there is no swelling or expansion of Natco Conduit when in con-

tact with moisture or heat, to strain, crack or damage the surrounding masonry or encasement.

Non-combustible—

Natco Conduit, being non-combustible, cannot ignite or burn or generate smoke, fumes or gases—of highest importance where human safety must be given particular consideration.

Cable Pulling Advantages—

Natco's smooth glazed duct surfaces with an extremely low co-efficient of friction, never soften, swell, peel or buckle when subjected to moisture or heat, consequently there is never any reduction in area of duct openings, and always safe and easy cable pulling.

Dielectric Strength—

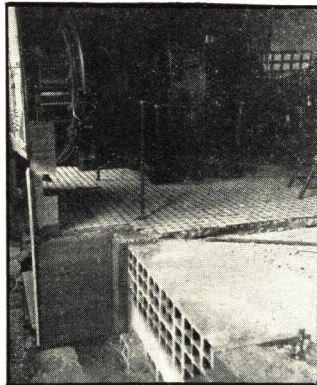
Natco Conduit possesses high dielectric strength, especially under wet conditions, and thus constitutes an effective insulator; also being impervious to moisture, it bars out this active medium of electrolysis.

Heat Dissipation—

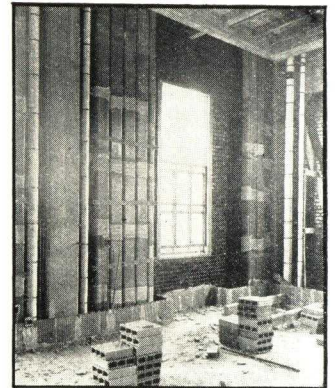
The thermal resistance of Natco Conduit is extremely low by reason of its porcelain-like character, and consequently it is an excellent conductor or dissipator of cable heat.

Costs—

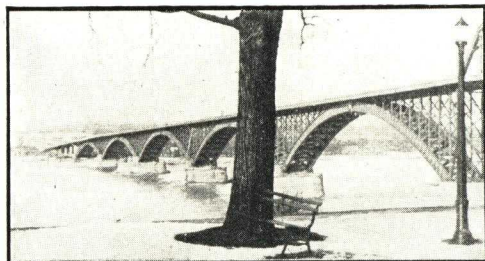
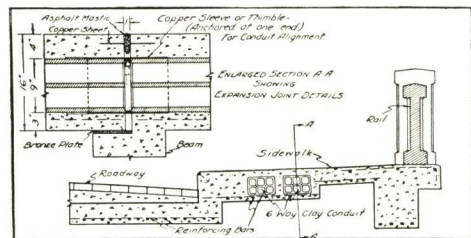
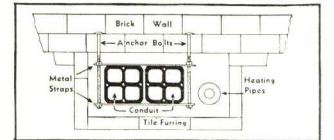
Installation costs are surprisingly low considering the perma-



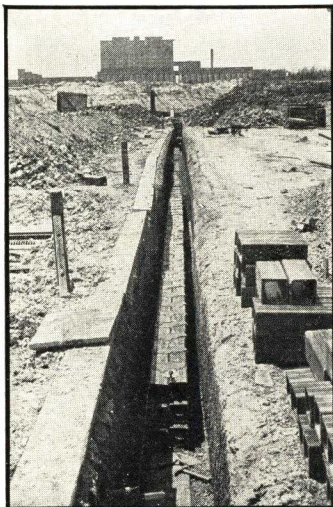
Natco Clay Conduit Under Floors of Power Stations in Institutional and Industrial Plants for Power and Lighting Cables



Natco Clay Conduit in Walls of Telephone and Telegraph Buildings for Riser Cables

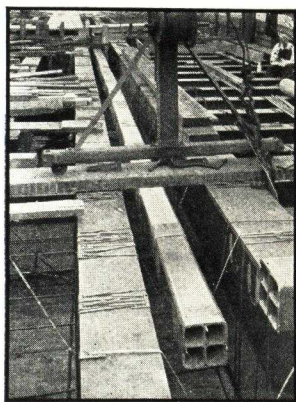


Natco Clay Conduit Embedded in the Masonry of a Modern Highway Bridge for Telephone, Power and Lighting Cables



A Municipal Light and Power Distribution System of Natco Clay Conduit

An entirely new type of conduit has just been developed for underground power distribution—Natco Soapstone Lubriduct. Write for particulars.



Natco Clay Conduit as an Integral Part of Viaducts for Street Lighting Cables and Street Railway Power Cables

Also in railroad track elevation for signal and communication cables.

General Description of Natco Conduit

Materials—

Natco Conduit is a rigid structure in a cellular form of vitrified clay with salt glazed surfaces.

Design—

Natco Conduit is combed or scarified on the outside surfaces, providing firm anchorage for joint and bedding mortar. It is beveled around the inner edges of ends of duct holes, making safe the pulling of cables.

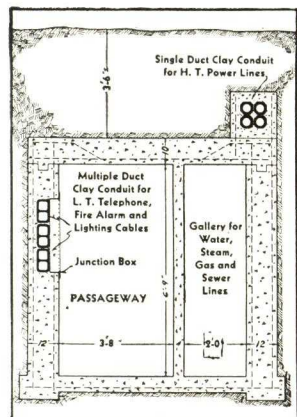
Natco Conduit in all multiple and some single forms is made with dowel holes extending through entire length of each piece, thus permitting use of special steel dowel pins at joints to insure easy and positive alignment and centering of duct holes. Two pins are used at each joint.

Natco Conduit can be obtained in the form of scored units, for splitting apart, making any part of a subway easy to break into and inspect, replace or repair.

Made in Two Types

Two general types of Natco Conduit are manufactured: single duct and multiple duct.

Natco Single Duct Conduit—Provides two heavy insulating walls between adjacent cables and permits breaking of joints throughout every duct line. Adapted for high tension power and lighting trunk lines, single cable terminals and for low tension laterals as in telephone lines. Also adapted for splaying conduit lines on approaches to man-holes. It is scarified lengthwise on four sides to provide anchorage for bedding mortar. Large bore single duct provided with through dowel holes in corners.



Natco Clay Conduit in Walls or Ceiling of a Typical Service Tunnel Serving Institutional and Industrial Plant Buildings

nence of conduit systems built of Natco Clay Conduit—and, of course, maintenance and depreciation are practically eliminated. Besides, cables are thus installed out of sight, safe from interference or interruptions, yet always readily accessible for inspection, repair, removal or salvage, eliminating expense of cable racking and constituting the ideal method of providing for future needs and growth. Natco offers more duct area of a permanent character per dollar expended.

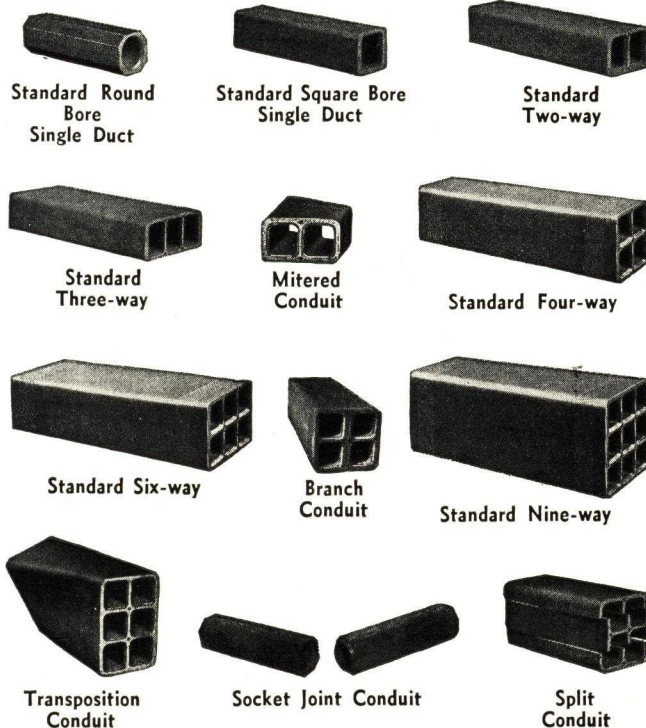
Low Expansion—

Natco Conduit possesses a very low coefficient of expansion—an important consideration in masonry or bridge construction. Bridge expansion can be readily compensated for in expansion joints of Natco Clay Conduit.



Natco Clay Conduit for Power and Lighting Cables Under Floors of an Industrial Shop Building

NATCO UNDERGROUND CLAY CONDUIT SHAPES AND SIZES



Duct holes		Number of dowel holes	Standard length, in.	Duct feet per piece	Actual size of duct hole, in.	Approximate outside dimensions, in.	Lengths in which short pieces are made, in.
Number per piece	Standard bore, in.						
Single Duct							
1	3 1/4 round	0	18	1 1/2	3 3/8	4 1/2 x 4 1/2	6, 9, 12
1	3 1/2 round	0	18	1 1/2	3 5/8	4 7/8 x 4 7/8	6, 9, 12
1	4 round	0	18	1 1/2	4 1/8	5 3/8 x 5 3/8	6, 9, 12
1	4 1/4 round	0	18	1 1/2	4 3/8	5 5/8 x 5 5/8	6, 9, 12
1	3 1/4 square	4	18	1 1/2	3 3/8	4 3/4 x 4 3/4	6, 9, 12
1	3 1/2 square	0	18	1 1/2	3 5/8	5 x 5	6, 9, 12
1	4 1/4 square	4	18	1 1/2	4 3/8	5 7/8 x 5 7/8	6, 9, 12
Multiple Duct							
2	3 1/4 square	2	24	4	3 3/8	4 3/4 x 8 3/4	6, 8, 12
3	3 1/4 square	4	24	6	3 3/8	4 3/4 x 12 3/4	6, 8, 12
4	3 1/4 square	5	36	12	3 3/8	8 3/4 x 8 3/4	6, 9, 12
6	3 1/4 square	2	36	18	3 3/8	8 3/4 x 12 3/4	6, 9, 12
9	3 1/4 square	4	36	27	3 3/8	12 3/4 x 12 3/4	6, 9, 12
2	3 1/2 square	2	24	4	3 5/8	5 1/4 x 9 3/4	6, 8, 12
3	3 1/2 square	4	24	6	3 5/8	5 1/4 x 13 3/4	6, 8, 12
4	3 1/2 square	5	36	12	3 5/8	9 3/8 x 9 3/8	6, 9, 12
6	3 1/2 square	2	36	18	3 5/8	9 3/8 x 13 3/4	6, 9, 12
2	4 1/4 square	2	24	4	4 3/8	5 1/8 x 11	6, 8, 12
3	4 1/4 square	4	24	6	4 3/8	5 1/8 x 16 1/8	6, 8, 12
4	4 1/4 square	5	36	12	4 3/8	11 x 11	6, 9, 12
6	4 1/4 square	2	36	18	4 3/8	11 x 16 1/8	6, 9, 12
9	4 1/4 square	4	24	18	4 3/8	16 1/8 x 16 1/8	6, 9, 12
Scored or Split Shapes							
1	All	..	18	....	...	.....	6, 9, 12
2 and 3	standard	..	18	....	...	.....	6, 8, 12
4 and 6	bores	..	18	....	...	.....	6, 9, 12
		..	18	....	...	.....	6, 9, 12

SLANTS OR MITERED CONDUIT

Number of duct holes per piece	Standard bore	Length, in.	Angle in degrees	Nominal radius, ft.	Position
1	All standard bores	6x6 3/4	3	10	.....
2, 4, 9	..	6x6 3/4	3	10	.....
3, 6	..	6x6 3/4	3	10	 edge or flat

Note: Natco Branch Conduit and Natco Transposition Conduit also supplied in all standard shapes.

Dowel Pins—5/8 x 3 in. special steel dowel pins with center washer.

Joint Tape—4 and 6-in. widths, 25-yd. rolls. Adhesive waterproof coating on one side. Used for wrapping joints before mortaring.

An entirely new type of conduit has just been developed for underground power distribution—Natco Soapstone Lubriduct. Write for particulars.

AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

Manufacturers of Electrical Wires and Cables

SALES OFFICES

CHICAGO, 208 So. LaSalle Street
CLEVELAND, Rockefeller Building
DETROIT, Buhl Building
CINCINNATI, Union Trust Building
ST. PAUL, First National Bank Building
MILWAUKEE, 850 Bankers Building
ST. LOUIS, 506 Olive Street
KANSAS CITY, 417 Grand Avenue

OKLAHOMA CITY, Ramsey Tower
BIRMINGHAM, Brown-Marx Building
MEMPHIS, Sterick Building
DALLAS, Praetorian Building
DENVER, First National Bank Building
SALT LAKE CITY, Walker Bank Building
NEW YORK, Empire State Building

BOSTON, Statler Building
PITTSBURGH, Frick Building
PHILADELPHIA, Widener Building
ATLANTA, 696 Whitehall Street, S. W.
WORCESTER, 94 Grove Street
BALTIMORE, First National Bank Building
BUFFALO, 670 Ellicott Street
WILKES-BARRE, Miners Bank Building

PACIFIC COAST DISTRIBUTORS, COLUMBIA STEEL COMPANY

SAN FRANCISCO, Russ Building
LOS ANGELES, 2087 E. Slauson Avenue

PORTLAND, 777 Nicolai Street
SEATTLE, 4th Avenue So. and Connecticut Street

EXPORT DISTRIBUTORS, United States Steel Products Company, 30 Church Street, NEW YORK

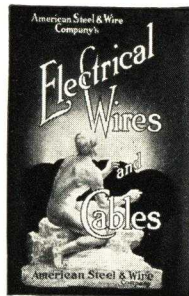
Products

BARE WIRES and CABLES for Telephone, Telegraph, Street Railway and Long Distance Power Transmission purposes in Copper, Iron and Steel; ELECTRICAL WIRES and CABLES for all purposes.

For our pages on Wire Rope and Concrete Reinforcement, see Manufacturers' Index.

Bare Copper Wires and Cables

Copper Trolley Wire—Generally made of hard drawn copper and



of the above. Descriptive pamphlets furnished on request.

We also make special magnet wire to specifications.

Annunciator and Office Wire

Annunciator Wire—Used in primary battery circuits for call bell or annunciator wiring in hotels, offices or houses. This is insulated with two firm winds of cotton applied in opposite directions and saturated with specially prepared paraffin wax compound. Put up on spools weighing from 5 to 7 lbs. or in paper cartons $\frac{1}{4}$ to 1 lb. each.



Annunciator Wire

Office Wire—Standard grade consists of a copper conductor, insulated with one wind and one braid of cotton, both of which are applied tight and even. Thoroughly saturated with our special paraffin wax compound.

Used largely by telephone and telegraph companies for inside wiring, extending from the instruments to junction where they connect with outside wires and cables as they enter building. Put up in coils of about 20 lb.



Office Wire

Special Annunciator and Office Wire—Special kinds furnished as specified. Also conductors of other than standard sizes, either solid or stranded. Untinned copper wire is used in the regular product, but tinned wire will be furnished if required.

Multiple Conductors—Any of these insulated wires supplied, two in parallel or twisted in pairs, in 3-conductor cables or in cables having any number of conductors. Can be covered with one or more braids or with tape and braid and finished in any manner specified.

Weatherproof and Slow Burning Wires and Cables

These have moderate degree of insulation and are less expensive than rubber insulated conductors.



Reliance Weatherproof Wire

Solid copper wire, triple braid, black finish

supplied in three shapes; round, grooved and figure eight.

Hard, Medium Hard or Soft Copper Wire—Bare

or tinned. Used for all purposes: nails, screens, insulated wires, telephone and telegraph wires, transmission lines. Can be supplied in coils, on spools or reels.

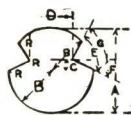
Stranded and Flexible Copper Cable—For feeder lines, ground return, insulating purposes, brush leads and similar purposes.

Rail Bonds

Made in various forms to meet track and joint conditions. The types include bonds applied under or around angle bars and directly to ball of rail, such as solid or flexible stud terminal bonds, either pin driven or compressed; flame-weld bonds of all-copper or steel terminals, which are designed for direct application to rail with oxy-acetylene torch using copper flux wire; arc-weld bonds; removable mine bonds; also flame-weld and steel terminal signal bonds.

Magnet Wire

All copper wire used for magnet wire is thoroughly annealed by processes which insure uniform and extreme softness, highest conductivity and ease of handling. All wire is carefully inspected for size, uniformity of dimensions, freedom from scale and all surface imperfections. Our magnet wire is made in all standard sizes, in round, square, and rectangular, and is insulated with the following materials: cotton, silk, enamel, paper, asbestos or with combinations of any



Grooved

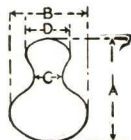
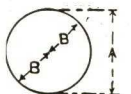


Figure 8



Round



Double and triple braid. Reliance weatherproof wires meet every requirement for outdoor service, while Reliance slow burning wire is superior for indoor uses.

Wires and cables are made in strict accordance with all requirements of the National Board of Fire Underwriters, sizes varying from No. 20 B&S to the largest feeder cables used.

Americore Flexible Cords

The term "cord" is ordinarily applied to any small pliable cable consisting of two or more flexible conductors insulated with rubber and braid. Under this heading are included all lamp and reinforced portable cords, brewery, canvasite, packinghouse, theater stage, border light, and heater cord.

The conductors are made up of No. 30 B&S gauge and smaller, bunched together, covered with a close, tight wind of fine cotton, and insulated with required thickness of rubber, and finished in accordance with the following Underwriters' standard types. Cords approved by Underwriters carry either the paper label, or the so-called 5-ft. (band type) label.

Type C	Lamp Cord
Type P	Reinforced Cord
Type PO	Parallel Cord
Type PD	Twisted Portable
Type PWP	Moisture Proof Reinforced Cord
Type K	Braided Heavy Duty Cord
Type HPD	Twisted Heater Cord Braid OA
Type HC	Twisted Heater Cord Braid over Shingles
Type HPO	Parallel Heater Cord
Type S	"Amerclad" Heavy Duty Rubber Clad
Type SJ	"Amerclad" Light Duty Rubber Clad

Elevator Lighting, Control and Annunciator Cable

These cables are made to conform to National Board of Fire Underwriters' requirements. Our new standards are considerably more flexible than those usually offered. The steel supporting strands, when used, are of special design. The braids have distinctive colors so that they can be easily distinguished from one another.

Lighting Cables—Generally made size 14 and in two or three conductors.

Control Cables—Made size 16 and in any number of conductors from two to thirty.

Annunciator Cables—Usually size 18, although 16 is sometimes required. The number of conductors vary from two to twenty-five or more.

Rubber-insulated and Braided Wires and Cables

Used for general interior light and power wiring.

The conductor consists of uniformly soft annealed commercially pure copper wire, insulated with code thickness of high grade vulcanized rubber protected with closely woven, strong and elastic braids.

All conductors are thoroughly and evenly coated with tin to protect the copper from any injurious effect from the sulphur in the rubber insulation.

Grades of Rubber Insulation—Three standard grades of rubber compound are made for rubber covered conductors. In addition to which we have innumerable other compounds containing from 20 to 60% rubber to meet customer's specifications requiring unusual characteristics such as super-ageing, corona-resistance, high density, or low electric-static capacity.

Americore—This grade exceeds all the requirements of the National Board of Fire Underwriters and is recommended for all service conditions within the limits of the National Electric Code.

Amparak—This is an "intermediate" grade commonly known as *engineers' wire*. The insulation is of a high grade performance test compound made to suit the demand of engineers and architects desiring a better wire than Americore but not so high a quality as Amerite. This grade is recommended for wiring in dwellings, office buildings, industrial plants, etc.

Amerite—This grade has always been identified as a 30% compound of the highest order. The insulation contains only the best Hevea rubber and other necessary ingredients to provide its great strength and elasticity, high insulating value and embodies the latest developments in "Performance Test" specifications with exceptional ageing qualities. Amerite wires and cables may be obtained in any size and finish for all services and voltages.

Parkway and Suburban Cables

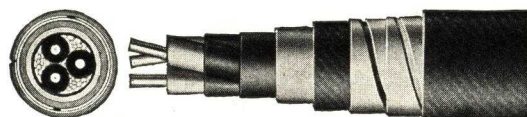
Designed for use without conduit or other protection, and offer all the advantages of a cable in conduit at but a small part of the cost of such a system. Usually laid in the ground in a shallow trench from 12 to 24 in. below the surface, the depth depending upon the location, no other protection being necessary due to their construction.

Made with any number of conductors, or any size, either solid or stranded, and for any voltage. They may be insulated with rubber, with paper, or with cambric. Ordinarily Amerite 30% rubber compound is used.

All lead, jute, flat steel or round wire armor used in these cables comply with I. P. C. E. A. standards. The following illustrations show constructions used ordinarily. Besides steel tapes, we can also supply non-magnetic metal tapes, and Armorlokt tapes, also Triple "L" non-metallic sheathed Parkway Cable described below.



Single Conductor, Flat Steel Taped



Three Conductors, Flat Steel Taped



Single Conductor Armorlokt Tape

Parkway and Suburban Cables
Rubber insulated

Used in street lighting, railroad yard lighting, coal mines, industrial plants, park and ground lighting, submarine service under lakes and rivers where tensile strength is not looked for, railway signal service, etc.

Triple "L" (Leadless Laid) Non-metallic Sheathed Parkway Cable—We have developed a complete line of these cables. Types RJ, RJB, RJT and RJBT all embody rubber compounds of known merit as regards water absorption. Effectively covered and hermetically sealed with asphaltic tapes and jute coverings. Light, flexible and very economical in cost. They resist acids, alkalis, etc. Well suited for airport lighting, wiring of farms, yards and street lighting and rural distribution.

Service Drop Cable

For pole-to-house service. Designed to permanently withstand all weather conditions without eventual appearance of unsightly drappings of rotted braid coverings so common to most such installations after a short while. Made up in sizes 12 to 2 B&S gauge in 2, 3 and 4-conductor styles with or without grounded neutral, insulation thickness for any voltage.

Americore Locomotive Gathering Cables and Americore Mining Machine Cables



Mining Machine Cable



Duplex Concentric Stranded Mining Machine Cable

These cables consist of flexible conductors insulated with code thickness (600 volts) of Americore rubber protected by one or two heavily weatherproofed cotton braids, while multiple conductor cables have in addition 2 or 3 weatherproofed cotton braids overall. These may consist of regular or corded cotton and tubular weave. Standard constructions are single, twin, and concentric conductor cables.

Americore Kant Kink Locomotive Cables

Same as above except special unbreakable braided covering.

Amerclad Locomotive Gathering, Mining Machine and Welding Cables



Rubber-clad Locomotive Gathering and Mining Machine Cable

These cables consist of flexible conductors Amerite (high grade 30% rubber compound) insulated, protected by an outer "Amerclad" sheath, a 60% specially compounded, smooth, tough, wear resisting rubber, vulcanized in a mold, and having the toughness and wearing characteristics of an automobile tire. Practically proof against deteriorating effects of oils, acids, alkalis, etc. These are made up in single, flat and round twin, and multiple conductor round, insulated for 600 volts and are fast replacing ordinary braided styles.

Insulated Power Cables for Transmission and Distribution

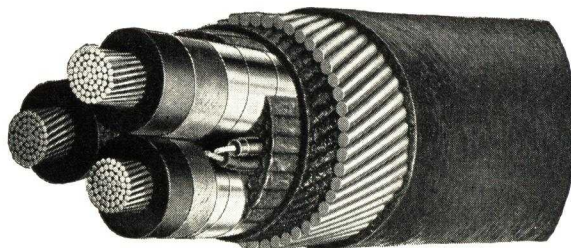
For over thirty years this Company has been a leader in the development and manufacture of all types of power cables adapted for use in transmission and distribution of electrical energy. We are prepared to offer a cable designed to render the most economical and satisfactory service for any particular case, provided necessary information listed above is available to our Engineers.

In general, three types of insulation are available with a variety of protective coverings with which to meet a given set of requirements.

Rubber Insulated and Leaded Cables—All rubber stocks described heretofore, as well as Amerzone (Ozone Proof), Amperox (Super-ageing), and Amarine (Submarine) may be incorporated in cables having any one, or a combination of several, outside coverings. Rubber and Lead cables are, of course, most common. These may be finished with jute, round, flat or interlocking armor of steel or zinc used in combination with saturated jute servings. Rubber insulated cables are also available non-leaded or non-metallic sheathed. The former serve as riser, bore-hole and buried cables.

Our Engineers will design cables to meet your service requirements.

Submarine Cable—Amarine (40% Submarine compound) has long occupied an enviable position. Its use



Submarine Cable

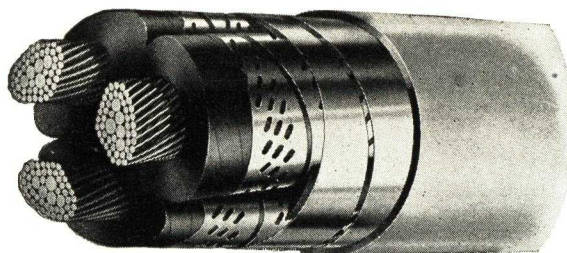
has been confined largely to cables of the non-leaded type as shown. Hundreds of miles are in operation at voltages up to 22 kv. and in lengths up to nine miles.

Varnished Cambric Cable—Our standard materials comply in all respects with the very rigid specifications of the Insulated Power Cable Engineers Association. Modern machines and facilities enable us to produce insulation having high break-down strength and low di-electric loss, as well as excellent mechanical characteristics. We can furnish any type of cable in any conceivable combination.

Paper-insulated Cable—Our standards for this class of cable are the rigid specifications of the Associated Edison Illuminating Companies. Cables up to 13,000 volts are for the most part either single-conductor or multiple-conductor belted. Beyond this, Type H shielded cable is used almost universally. (See accompanying figure.) All sector cable embodies conductors formed of many wires which, in combination, give the desired shape without having to be crushed. This results in greater flexibility and reduced diameters.

The insulation which we offer is of most uniform quality. Many hundreds of miles of high-voltage cable of our manufacture have operated over the past decade without a reported failure.

We invite an opportunity to furnish additional data, engineering consultation and quotations.



Type H Paper-insulated Cable

JOHN A. ROEBLING'S SONS COMPANY

Manufacturers of Insulated Wires and Cables

MAIN OFFICE
TRENTON, N. J.

For Branch Offices and Warehouses, see our Wire Rope and Accessories Pages
For Wire Rope and Accessories and Welding Wire and Electrodes, see Manufacturers' Index

ELECTRICAL WIRES AND CABLES

Roebling Products

The Roebling products described herein are manufactured by the Insulated Wire Division at Trenton, N. J.

Complete stocks of all standard constructions of magnet, weatherproof, rubber insulated and many other miscellaneous Electrical Wires and Cables are carried in our branch warehouses to assure our customers of prompt service.

Careful inspection and tests of raw materials and the checking of manufacturing operations, result in the uniformly high quality that has made "Roebling" a mark of distinction.

Weatherproof Wire and Cable

Weatherproof wire is used outdoors principally for feeder cable, or power and lighting distributing circuits. The conductors may be hard drawn, medium hard drawn, or annealed copper.



Roebling Stranded Triple Braid Weatherproof Wire

The insulation is two or three braids of yarn, so constructed that the finished product will meet flexibility requirements and effectively retain the dense black weatherproof saturant with which they are thoroughly filled. The saturated insulation is coated with a high melting point compound which, when burnished and polished, renders the surface hard, smooth and glossy. This prevents the wire from sticking, makes installing easy and reduces to a minimum the tendency of the wire to collect sleet.

Impregnated Paper Insulated Lead Sheathed Cable

Paper insulated power cable is used principally for underground transmission, distribution or service circuits. It is usually installed in conduit, but may be installed by suspension from a messenger strand carried on a pole line. If it is to be installed directly in the earth, flat steel tape armor is usually applied over the sheath for mechanical protection. As submarine cable it should be served with round wire armor for protection against lateral stresses imposed by tides, submerged drifting material, boats and dragging anchors.



Roebling Impregnated Paper Insulated Lead Sheathed Cable

As compared with rubber or varnished cambric insulation, impregnated paper has the advantage of low cost, high dielectric strength, low power factor and dielectric loss, and higher permissible operating temperatures.

Varnished Cambric Insulated Cables

Varnished cambric insulated cable is used for power, heat or lighting circuits in central stations, sub-stations, mines, steel mills, cotton mills and other industrial plants. It is commonly used for generator and motor leads and is especially well adapted for transformer and oil switch leads.



Roebling Varnished Cambric Insulated Lead Encased Cable

Weatherproof, slow-burning or asbestos braids can be furnished.

Rubber Insulated Braided and Lead Sheathed Wires and Cables

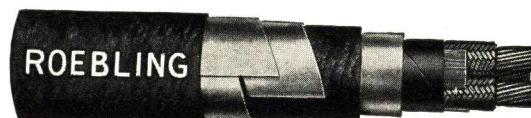
Inter-ROEBLING-Grade rubber covered wire is a high grade product recommended for use where a higher grade than code wire is required, such as in schools, municipal and state buildings, etc.

30%-ROEBLING-Grade rubber covered wires are especially high grade products designed to meet A.R.A., A.S.T.M. or performance type requirements. These wires are for use in railway signal service, telephone and telegraph service, marine service, and all installations where the service is particularly severe and the life hazard unusual.



Roebling Three-conductor Rubber Insulated Lead Sheathed Cable

Braided or lead sheathed rubber insulated wires and cables are made in single, twin flat, 3-conductor and 4-conductor round, solid or stranded constructions in accordance with the most exacting specifications, and for all conditions of power transmissions, lighting or signal service—underground, submarine or aerial.



Roebling Three-conductor Stranded Parkway Cable

Cables can be furnished with any combination of armored coverings in accordance with the purchaser's specifications.

GENERAL ELECTRIC COMPANY

GENERAL OFFICE

1 River Road, SCHENECTADY, N. Y.

SALES OFFICES (ADDRESS NEAREST OFFICE)

AKRON, OHIO, 106 South Main Street
 ATLANTA, GA., 187 Spring Street, Northwest
 BALTIMORE, MD., 39 West Lexington Street
 BINGHAMTON, N. Y., 19 Chenango Street
 BIRMINGHAM, ALA., 600 No. Eighteenth Street
 BOSTON, MASS., 140 Federal Street
 BUFFALO, N. Y., 1 West Genesee Street
 BUTTE, MONT., 20 West Granite Street
 CANTON, OHIO, 700 Tuscarawas Street, West
 CEDAR RAPIDS, IOWA, 203 Second Street, S.E.
 CHARLESTON, W. VA., 304 Capitol Street
 CHARLOTTE, N. C., 200 South Tryon Street
 CHICAGO, ILL., 230 South Clark Street
 CINCINNATI, OHIO, 215 West Third Street
 CLEVELAND, OHIO, 4966 Woodland Avenue
 COLUMBUS, OHIO, 17 South High Street
 DALLAS, TEX., 1801 North Lamar Street
 DAVENPORT, IOWA, 511 Pershing Avenue
 DAYTON, OHIO, 25 North Main Street
 DENVER, COLO., 650 Seventeenth Street
 DES MOINES, IOWA, 418 West Sixth Avenue
 DETROIT, MICH., 700 Antoinette Street
 DULUTH, MINN., 14 West Superior Street
 EL PASO, TEX., 109 North Oregon Street
 ERIE, PA., 10 East Twelfth Street
 FORT WAYNE, IND., 1635 Broadway

FORT WORTH, TEX., 410 West Seventh Street
 GRAND RAPIDS, MICH., 148 Monroe Avenue, N. W.
 HARTFORD, CONN., 18 Asylum Street
 HOUSTON, TEX., 5 North Milam Street
 INDIANAPOLIS, IND., 110 North Illinois Street
 JACKSON, MICH., 212 Michigan Avenue, West
 JACKSONVILLE, FLA., 700 East Union Street
 KANSAS CITY, MO., 106 West 14th Street
 KNOXVILLE, TENN., 602 South Gay Street
 LOS ANGELES, CALIF., 5201 Santa Fe Avenue
 LOUISVILLE, KY., 455 South Fourth Street
 MEMPHIS, TENN., 8 North Third Street
 MILWAUKEE, WIS., 940 West St. Paul Avenue
 MINNEAPOLIS, MINN., 107 South Fifth Street
 NASHVILLE, TENN., 234 Third Avenue, North
 NEWARK, N. J., 744 Broad Street
 NEW HAVEN, CONN., 129 Church Street
 NEW ORLEANS, LA., 837 Gravier Street
 NEW YORK, N. Y., 120 Broadway
 NIAGARA FALLS, N. Y., 201 Falls Street
 OKLAHOMA CITY, OKLA., 119 North Robinson Street
 OMAHA, NEB., 409 South Seventeenth Street
 PHILADELPHIA, PA., 1405 Locust Street
 PHOENIX, ARIZ., 441 W. Madison Street
 PINE BLUFF, ARK., 501 Main Street

PITTSBURGH, PA., 535 Smithfield Street
 PORTLAND, ORE., 329 Alder Street
 PROVIDENCE, R. I., 76 Westminster Street
 RICHMOND, VA., 700 East Franklin Street
 ROANOKE, VA., 202 South Jefferson Street
 ROCHESTER, N. Y., 89 East Avenue
 ST. LOUIS, MO., 112 North Fourth Street
 SALT LAKE CITY, UTAH, 200 South Main Street
 SAN ANTONIO, TEX., 201 Villita Street
 SAN FRANCISCO, CALIF., 235 Montgomery Street
 SCHENECTADY, N. Y., 1 River Road
 SEATTLE, WASH., 821 Second Avenue
 SPOKANE, WASH., 421 Riverside Avenue
 SPRINGFIELD, ILL., 607 East Adams Street
 SPRINGFIELD, MASS., 116 Liberty Street
 SYRACUSE, N. Y., 113 South Salina Street
 TACOMA, WASH., 1019 Pacific Avenue
 TOLEDO, OHIO, 405 Madison Avenue
 TRENTON, N. J., 143 East State Street
 TULSA, OKLA., 409 South Boston Street
 UTICA, N. Y., 258 Genesee Street
 WASHINGTON, D. C., 806 Fifteenth Street, N.W.
 WATERBURY, CONN., 72 W. Liberty Street
 WORCESTER, MASS., 340 Main Street
 YOUNGSTOWN, OHIO, 25 East Boardman Street

CANADA: Canadian General Electric Company, Ltd., Toronto

HAWAII: W. A. Ramsey, Ltd., Honolulu

Motor Dealers and Lamp Agencies in All Large Cities and Towns

SERVICE SHOPS

ATLANTA, 496 Glenn Street, S.W.
 BUFFALO, 318 Urban Street
 CHICAGO, 509 East Illinois Street
 CINCINNATI, 215 West Third Street
 CLEVELAND, 4966 Woodland Avenue
 DALLAS, 1801 North Lamar Street

DETROIT, 5950 Third Avenue
 HOUSTON, 5 North Milam Street
 KANSAS CITY, 819 East 19th Street
 LOS ANGELES, 5203 Santa Fe Avenue
 MILWAUKEE, 940 West St. Paul Avenue
 MINNEAPOLIS, 410 Third Avenue, North
 NEW YORK, 416 West Thirteenth Street

PHILADELPHIA, 429 North Seventh Street
 PITTSBURGH, 16 Terminal Way
 ST. LOUIS, 1110 Morgan Street
 SALT LAKE CITY, 360 West Second South Street
 SAN FRANCISCO, 340 First Street
 SEATTLE, 1508 Fourth Avenue, South

Distributors for the General Electric Company outside of the United States and Canada

INTERNATIONAL GENERAL ELECTRIC CO., INC.

New York, N. Y., 120 Broadway

General Sales Offices, Schenectady, N. Y.

PARTIAL LIST OF G-E PRODUCTS

ADAPTERS: Electric Lamp, Fuses, Vacuum Tube, Pipe, Mine, Trolley, Wiring, Cord.
 AIR CONDITIONING APPARATUS.
 AIRCRAFT INSTRUMENTS and SUPPLIES.
 ALTERNATORS (Electric).
 AMMETERS.
 BATHS: Oil Tempering.
 BEACONS: Airport and Airway.
 BLOWERS: Exhaust, Pressure, Turbine (Centrifugal).
 BOILERS, ELECTRIC and OIL BURNING.
 BOOSTERS (Motor-driven).
 BOXES: Conduit, Control, Cable, Switch, Fuse, etc.
 BRACKETS: Lighting Fixture, Lamp, Pole.
 BRAKES: Air, Trolley, Friction, Electric.
 BRAKES: Solenoid.
 BREAKERS: Electric Circuit (Air, Oil, Overload, Underload, Railway Station, Explosion Chamber).
 BRUSHES: Commutator, Collector, Circuit Breaker, Motor, Generator.
 BUSHINGS: Conduit, Outlet, Adapter, Insulating, Transformer, Oil-filled, High-voltage.
 CABLE: Electric Conducting (All Types).
 CABLE TESTING APPARATUS.
 CAPACITORS.
 CAPACITOR-MOTORS.
 CARRIER CURRENT COMMUNICATION and CENTRAL DISPATCH EQUIPMENT.
 CHARGERS: Battery, Bulb, Mercury Arc, Motor Generator, and Gas-engine Superchargers.
 CHARGING SETS for BATTERIES (Electric).
 CLOCKS: Electric Time.
 CLOCKS: Electric Contact-making.
 CLOTH: Varnished, Treated, Dielectric.
 COILS: Resistance.
 COLLECTORS: Third Rail.
 COLOR TESTERS: Photoelectric Color Comparators and Analyzers.
 COMMUTATORS: Current.
 COMPENSATORS: Electric.

COMPOUNDS: Insulating, Protecting, Treating.
 COMPRESSORS: Air and Gas, Centrifugal.
 COMPRESSORS: Motor-driven, Turbine-driven.
 COMPRESSORS: Centrifugal, Reciprocating (Railway).
 CONDENSERS: Static and Synchronous.
 CONDUIT and CONDUIT PRODUCTS: Electric.
 CONTROL SYSTEMS and DEVICES: Electric.
 CONTROLLERS: Electric, Crane, Hoist, Elevator, Motor, Fan, Circuit, Governor, Compressor, Heat, Pressure, Printing Press, Pump, Railway, Speed, Vacuum.
 COOLERS: Electric Water.
 COUPLINGS: Shaft, Cable.
 CUTOUPS.
 DEMAND METERS.
 DRYERS and PURIFIERS: Transformer Oil.
 DYNAMOMETERS.
 DYNAMOTORS.
 ELECTRODES (Welding and Carbon Lamp).
 EXCITERS.
 FANS: Electric Desk, Wall, Ceiling, Portable, Window Ventilating, Exhaust.
 FIXTURES: Lighting.
 FLOODLIGHTS and EQUIPMENT.
 FURNACES: Electric Industrial, Melting, Treating, Processing.
 FUSES: Electric.
 GAUGES: Electric (Vacuum, Pressure, Liquid-level).
 GAUGES: Electric Measuring (Micrometer).
 GEARS and PINIONS: Cloth, Fabric, Compound, Fiber, Rawhide, Automotive, Machine, Steel, Brass, Bronze.
 GEARS: Reduction.
 GENERATORS: Electric and Turbine-driven, Hydro-electric or Engine.
 GENERATORS (Steam Producers).
 HEADLIGHTS: Electric Car and Locomotive.
 HEATERS: Electric

HEATERS: Liquid Electric Immersion.
 IGNITION TRANSFORMERS.
 INDICATORS: Electric (Current, Potential, Frequency, Power-factor, Synchronism).
 INDICATORS: Remote Position.
 INSTRUMENTS: Electric (Measuring, Testing, Recording, Indicating, Temperature, Control, Railway Signal).
 INSULATING MATERIALS (Shellacs; Varnishes; Treated Fabrics, Papers and Fibers; Compounds; Paints, Tape, Textiles, Glyptal).
 INSULATION.
 INSULATORS (Porcelain, Bushings, etc.).
 IRONS: Electric Soldering.
 IRONERS: Clothes, Electric.
 LAMPS: Mazda.
 LIGHTS and LIGHTING EQUIPMENT: Electric.
 LIGHTNING ARRESTERS.
 LOCOMOTIVES: Electric Main Line, Switching, Branch, Passenger, Freight, Mine.
 LOCOMOTIVES: Electric, Oil-electric, Gas-electric, Battery-electric.
 METERS and INSTRUMENTS (All Types).
 MOTORS: Electric (All types and sizes, drives for all applications).
 OHMMETERS.
 OSCILLOGRAPHS.
 OVENS: Electrical Industrial.
 PANELS and PANELBOARDS.
 PAPER: Treated (Insulating).
 PHOTO-ELECTRIC DEVICES.
 PINIONS: Metallic and Non-metallic.
 PUMPS: Centrifugal.
 PUMPS: Condensation, Vacuum.
 QUARTZ GLASS.
 RADIO.
 RAILWAY SUPPLIES: Electric.
 REACTORS.
 RECTIFIERS: Battery-charging.
 RECTIFIERS: Electric current.
 REFRIGERATORS and REFRIGERATING UNITS: Electric (Auto Mechanical).
 REGULATORS: Controllers, Electric, Induction Feed, Voltage, Speed.

RELAYS: Electric, Control, Protective, Signal.
 RESINS (Synthetic).
 RESISTORS.
 RHEOSTATS.
 RESISTANCE COILS, UNITS, GRIDS, PLATES.
 SEARCHLIGHTS and PROJECTORS.
 SELSYN APPARATUS.
 SHIP PROPULSION EQUIPMENT.
 SOLDERING POTS, IRONS, SETS: Electric.
 SOLENOIDS.
 STAGE LIGHTING CONTROL.
 STARTERS: Electric Motor, etc.
 SIGNALS: Electric Street Traffic, Railway, etc.
 SUBSTATION APPARATUS and EQUIPMENT.
 SWITCHBOARDS: Electric (All Types).
 SWITCHES: Wiring, Station, Outdoor, Indoor, Disconnecting, Lighting, Appliance, Automatic, Control, Snap, Push, Pull, Knife, Remote Control, etc.
 SWITCHGEAR.
 TELEMETERING EQUIPMENT.
 TESTERS: Circuit, Coil, Oil, Insulation, Meter, etc.
 THERMOCOUPLES.
 THERMOSTATS: Miscellaneous.
 THYATRON TUBES and CONTROL.
 TRANSFORMERS (All Types).
 TUBES: Vacuum.
 TURBINES: Marine, Mercury, Ship Propulsion.
 TURBINE-GENERATOR SETS.
 VACUUM CLEANERS: Electric Portable.
 VALVES: Solenoid-operated (For remote control of gases and liquids under pressure, whistle).
 VARNISH: Insulating.
 WASHING MACHINES: Electric.
 WATTMETERS.
 WELDERS and WELDING SETS: Electric, Arc, Automatic.
 WELDING EQUIPMENT and ACCESSORIES.
 WIRE and CABLE.
 WIRING DEVICES.

GENERAL ELECTRIC WIRING MATERIALS

GENERAL ELECTRIC COMPANY—MERCHANDISE DEPARTMENT

BRIDGEPORT, CONN.

General Electric Wiring Materials are sold through G-E Merchandise Distributors Listed Below

For General Office, Sales Offices, Service Shops, see Manufacturers' Index

G-E MERCHANDISE DISTRIBUTORS

- ALABAMA**, Birmingham, Matthews Electric Supply Co.
ARIZONA, Phoenix, General Electric Supply Corp.
ARKANSAS, Little Rock, General Electric Supply Corp.
CALIFORNIA, Long Beach, General Electric Supply Corp.
 Los Angeles, General Electric Supply Corp.
 Oakland, General Electric Supply Corp.
 Sacramento, General Electric Supply Corp.
 San Diego, General Electric Supply Corp.
 San Francisco, General Electric Supply Corp.
COLORADO, Denver, Hendrie & Bolthoff Manufacturing & Supply Co.
 General Electric Supply Corp.
CONNECTICUT, Bridgeport, General Electric Supply Corp.
 Hartford, General Electric Supply Corp.
 New Haven, General Electric Supply Corp.
 Waterbury, General Electric Supply Corp.
DISTRICT OF COLUMBIA, Washington, National Electrical Supply Co.
FLORIDA, Jacksonville, General Electric Supply Corp.
 Miami, General Electric Supply Corp.
 Tampa, General Electric Supply Corp.
GEORGIA, Atlanta, General Electric Supply Corp.
 Savannah, General Electric Supply Corp.
ILLINOIS, Chicago, General Electric Supply Corp. (and branch)
 Metropolitan Electrical Supply Co.
 Quincy, Crescent Electric Supply Co.
 Rockford, General Electric Supply Corp.
 Springfield, General Electric Supply Corp.
INDIANA, Evansville, General Electric Supply Corp.
 Fort Wayne, Protective Electrical Supply Co.
 Indianapolis, General Electric Supply Corp.
 Muncie, Triangle Wholesale Electric Co.
 Richmond, Richmond Electric Co.
 South Bend, South Bend Electric Company
 Terre Haute, Advance Electric Co.
IOWA, Burlington, Crescent Electric Supply Company
 Davenport, Crescent Electric Supply Company
 Des Moines, General Electric Supply Corp.
 Dubuque, Crescent Electric Supply Company
 Sioux City, General Electric Supply Corp.
KANSAS, Wichita, Sutton Electric Supply Company
KENTUCKY, Louisville, General Electric Supply Corp.
LOUISIANA, New Orleans, General Electric Supply Corp.
 Shreveport, General Electric Supply Corp.
MAINE, Bangor, General Electric Supply Corp.
 Portland, General Electric Supply Corp.
MARYLAND, Baltimore, General Electric Supply Corp.
MASSACHUSETTS, Boston, General Electric Supply Corp.
 Springfield, General Electric Supply Corp.
MICHIGAN, Battle Creek, Central Electric Supply Co.
 Detroit, Frank C. Teal Company
 General Electric Supply Corp.
 Grand Rapids, General Electric Supply Corp.
 Kalamazoo, C. J. Litscher Electric Company
 Muskegon, Fitzpatrick Electric Supply Co.
MINNESOTA, Duluth, General Electric Supply Corp.
 Minneapolis, General Electric Supply Corp.
 St. Paul, General Electric Supply Corp.
MISSOURI, Kansas City, General Electric Supply Corp.
 St. Louis, General Electric Supply Corp. (and branch)
MONTANA, Billings, General Electric Supply Corp.
 Butte, General Electric Supply Corp.
NEBRASKA, Omaha, General Electric Supply Corp.
- NEW JERSEY**, Jersey City, General Electric Supply Corp.
 Newark, General Electric Supply Corp.
 Paterson, General Electric Supply Corp.
NEW YORK, Albany, Havens Electric Company
 Binghamton, Southern Tier Electrical Supply Co.
 Buffalo, General Electric Supply Corp.
 New Rochelle, Royal Eastern Electrical Supply Co.
 New York, E. B. Latham & Company
 General Electric Supply Corp. (also Borough of Brooklyn and the Bronx)
 Royal Eastern Electrical Supply Co. (also Borough of Brooklyn, Long Island City and Jamaica, L. I.)
 Niagara Falls, General Electric Supply Corp.
 Poughkeepsie, Electric Supply Co., Inc.
 Rochester, General Electric Supply Corp.
 Syracuse, Langdon & Hughes Electric Co.
 Utica, Langdon & Hughes Electric Co.
NORTH CAROLINA, Charlotte, General Electric Supply Corp.
 Raleigh, General Electric Supply Corp.
NORTH DAKOTA, Fargo, Dakota Electric Supply Co.
OHIO, Akron, General Electric Supply Corp.
 Cincinnati, General Electric Supply Corp.
 Cleveland, General Electric Supply Corp.
 Columbus, General Electric Supply Corp.
 Dayton, General Electric Supply Corp.
 Toledo, General Electric Supply Corp.
 Youngstown, General Electric Supply Corp.
 Zanesville, The Roedel Co.
OKLAHOMA, Oklahoma City, General Electric Supply Corp.
 Tulsa, General Electric Supply Corp.
OREGON, Portland, General Electric Supply Corp.
PENNSYLVANIA, Erie, General Electric Supply Corp.
 Philadelphia, General Electric Supply Corp.
 Pittsburgh, General Electric Supply Corp.
 Scranton, General Electric Supply Corp.
 Williamsport, Lowry Electric Co., Inc.
RHODE ISLAND, Providence, General Electric Supply Corp.
SOUTH CAROLINA, Columbia, Perry-Mann Electric Co.
TENNESSEE, Chattanooga, General Electric Supply Corp.
 Knoxville, General Electric Supply Corp.
 Memphis, General Electric Supply Corp.
 Nashville, General Electric Supply Corp.
TEXAS, Abilene, General Electric Supply Corp.
 Amarillo, General Electric Supply Corp.
 Dallas, General Electric Supply Corp.
 El Paso, General Electric Supply Corp.
 Houston, General Electric Supply Corp.
 San Antonio, General Electric Supply Corp.
UTAH, Salt Lake City, General Electric Supply Corp.
VIRGINIA, Norfolk, General Electric Supply Corp.
 Richmond, General Electric Supply Corp.
WASHINGTON, Seattle, General Electric Supply Corp.
 Spokane, General Electric Supply Corp.
 Tacoma, Home Electric Company
WEST VIRGINIA, Bluefield, Bluefield Supply Co.
 Charleston, Virginian Electric Inc.
 Wheeling, Gee Electric Company
WISCONSIN, Appleton, General Electric Supply Corp.
 Madison, Crescent Electric Supply Co.
 Milwaukee, General Electric Supply Corp.

Products

A complete line of G-E WIRING MATERIALS, including Conduits, Steel Armored Conductors, Outlet Boxes, Floor Boxes, Fiberduct (for Underfloor Wiring), Insulated Wire and Cable, Lampholders, Receptacles, Switches, Convenience Outlets, Plugs, Fuses and Fuse Pullers.

For other G-E products listed in this edition, see Manufacturers' Index.



G-E Merchandise

Representative products for wiring and completing the electrification of plants and equipment that will be found useful to engineers, contractors and architects are listed herein. Detailed information on your electrical requirements may be obtained from G-E Merchandise Distributors listed above, or direct from GENERAL ELECTRIC COMPANY, Merchandise Department, Bridgeport, Conn. For a more detailed listing ask for Merchandise Catalogue.

G-E CONDUITS AND FITTINGS

Rigid Conduit

"G-E White"—

A mild steel, hot dipped galvanized conduit with Glyptal Coating for permanent installations.

Thoroughly protected inside and out against rust. Supplied in straight lengths and elbows cut and threaded, and with couplings accurately drilled and tapped.

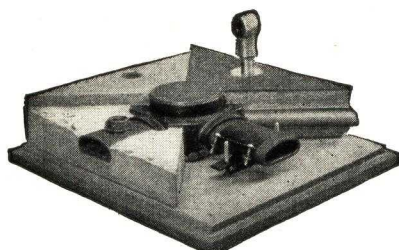
"G-E Black"—Made from exactly the same high grade steel, pickled, cleaned, straightened and threaded same as "G-E White," except that it is protected by a coating of corrosion-resistant black enamel instead of zinc.



"G-E White" Hot Dipped Galvanized Conduit

DIMENSIONS "G-E WHITE," "G-E BLACK" RIGID CONDUIT, IN.

Size	Diameter		Ft. per bundle	Threads per in.	Standard nipples lengths, in.
	External	Internal			
1/4	0.540	0.364	100	18	.....
3/8	0.675	0.493	100	18	.....
1/2	0.840	0.622	100	14	2 to 3 1/2
3/4	1.050	0.824	50	14	2 to 4
1	1.315	1.049	50	11 1/2	2 to 4
1 1/4	1.660	1.380	30	11 1/2	2 1/2 to 4 1/2
1 1/2	1.900	1.610	10	11 1/2	2 1/2 to 4 1/2
2	2.375	2.067	10	11 1/2	3 to 4 1/2
2 1/2	2.875	2.469	10	8	3 to 5 1/2
3	3.500	3.068	10	8	3 1/2 to 5 1/2
3 1/2	4.000	3.548	10	8	4 to 6
4	4.500	4.026	10	8	4 1/2 to 6
5	5.563	5.047	10	8	5 to 6 1/2
6	5.625	6.065	10	8	5 to 6 1/2



Cutaway Model Showing Detail of Installation of G-E Fiberduct

G-E Fiberduct

A non-corrodible raceway for under-floor wiring in concrete floors. Floor outlets may be established at any point along the line of the duct at any time during the life of the building.

"BX" Type ABC Flexible Steel Armored Conductors

Manufactured in sizes listed below. Each coil is tested for shorts, grounds, etc., and bears the label of the Underwriters' Laboratories, Inc. Continuous lengths up to 1000 ft. can be furnished. Standard coils range from 100 to 250 ft.



"BX" Type ABC Flexible Steel Armored Conductor

"BX" TYPE ABC FLEXIBLE STEEL ARMORED CONDUCTORS AND FITTINGS ADAPTED TO EACH SIZE

Sizes (B & S) Gauge	Approx. ft. in standard coil	Fittings for use with single strip conductors					
		Size K.O.	Str. box con'tors	45° con-nectors	+90° con-nectors	*Panel adapters	90° adapters

"BX" Two Conductor

14BX Solid	100-250	1/2	SP7120	SP6190	SP6192	SP7139	SP7142
12BX Solid	100-250	1/2	SP7120	SP6190	SP6192	SP7139	SP7142
10BX Solid	100-250	1/2	SP7124	SP6190	SP6192	SP7139	SP7142
8BX Stranded	100-150	1/2	SP6121	SP6191	SP6193	SP7139	SP7142
6BX Stranded	100	3/4	SP6121	SP6191	SP6193	SP7139	SP7142
4BX Stranded	100	3/4	SP6124	SP6194	SP6194A	SP7140	SP7143

"BX3" Three Conductor

14BX3 Solid	100-250	1/2	SP7120	SP6190	SP6192	SP7139	SP7142
12BX3 Solid	100-250	1/2	SP7124	SP6190	SP6192	SP7139	SP7142
10BX3 Solid	100-200	1/2	SP7124	SP6190	SP6192	SP7139	SP7142
8BX3 Stranded	100-150	1/2	SP7123	SP6194	SP6194A	SP7139	SP7142
6BX3 Stranded	100	3/4	SP6124	SP6194	SP6194A	SP7140	SP7143
4BX3 Stranded	100	3/4	SP6125	SP6194	SP6194A	SP7140	SP7143

"BX4" Four Conductor

14BX4 Solid	100-200	1/2	SP6121		†	SP7139	SP7142
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"BXL" Lead Covered Two Conductor

14BXL Solid	100-200	1/2	SP7124		†	SP7139	SP7142
12BXL Solid	100-200	1/2	SP7124		†	SP7139	SP7142
10BXL Solid	100-150	1/2	SP6121		†	SP7139	SP7142
8BXL Stranded	100-150	1/2	SP7123	SP6191	SP6193	SP7139	SP7142
6BXL Stranded	100	3/4	SP6124	SP6194	SP6194A	SP7140	SP7143
4BXL Stranded	100	1	SP6125		†	SP7151	SP7144
2BXL Stranded	100	1	SP6125		†	SP7151	SP7144

"BX" FLEXIBLE STEEL ARMORED CONDUCTORS AND FITTINGS ADAPTED TO EACH SIZE (Continued)

"BXL3" Lead Covered Three Conductor

14BXL3 Solid	100-150	1/2	SP7124		†	SP7139	SP7142
12BXL3 Solid	100-150	1/2	SP6121		†	SP7139	SP7142
10BXL3 Solid	100-150	1/2	SP7123	SP6191	SP6193	SP7139	SP7142
8BXL3 Stranded	100-150	3/4	SP6124	SP6194	SP6194A	SP7140	SP7143
6BXL3 Stranded	100	3/4	SP6124	SP6194	SP6194A	SP7140	SP7143
4BXL3 Stranded	100	1	SP6132			SP7151	SP7144

*Panel box connectors may be formed by assembling straight connectors with their respective panel adapters listed in this column.

†90° angle connectors may be formed by assembling straight connectors with their respective 90° angle adapters listed in last column.

BraidX Non-metallic Sheathed Cable

Furnished with or without grounding wire. BraidX is G-E code wire (2 or 3-wire and sizes No. 14 to 6) compactly enclosed in a fire-resisting, waterproof non-metallic sheath of high insulating quality. BraidX should be installed in

continuous runs from outlet to outlet, with no taps except at outlets. In no case is an insulating support required for BraidX.

Size	Ft. per coil	Fittings Adaptable	
		Connectors	Straps
14-2	250	SP7000 or SP7010	SP7021
12-2	200	SP7000 or SP7010	SP7021
10-2	200	SP7001 or SP7010	SP7021
8-2	125	SP7002	SP7022
6-2	125	SP7003	.....
14-3	200	SP7000 or SP7010	*
12-3	200	SP7000 or SP7010	*
10-3	200	SP7001 or SP7010	*
8-3	125	SP7002	*
6-3	125	SP7003	*

*Regular 1-hole or 2-hole pipe straps may be used for all sizes of three-conductor BraidX.



With ground wire



Without ground wire
Two-conductor BraidX

G-E Utility Outlet and Floor Boxes



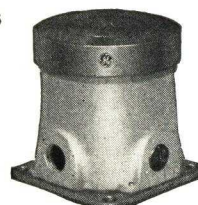
SP8000
General
Utility
Outlet



SP8200
Plug Outlet Type



SP8300
Extension Type



SP8400
Plug Type

Floor Boxes, Watertight

Outlet Boxes, Covers and Extension Rings—The pryout knockouts are clean-cut and readily removable; secure ears are an integral part of the box itself; screwholes are machine tapped and accurately centered. Made of standard gauge steel either galvanized or black enameled; 4-in. square, 4-in. octagon and round, and 3 1/4-in. octagon boxes and covers.

4-in. octagon boxes have outlets in sides and bottom for conduit. SP54151—4-in. octagon box, 1 1/2 in. deep. SP54171—4-in. octagon box, 2 1/2 in. deep. SP54155—4-in. octagon box, 1 1/2 in. deep (for loom and conduit).



SP52151
Outlet Box
4 in. Square,
1 1/2 in. Deep



SP52C1



SP52C3



SP52C12



SP52C13



SP52C28

4-in. Square Box Covers

SP52C1—Flat blank. SP52C3—Raised canopy type, 2 7/8-in. diameter. SP52C12—Raised pendent type, 3/8-in. eyelet bushing. SP52C13—Raised for single flush device, 1/2 in. deep, opening 2 1/8 x 1 1/8 in. SP52C28—Flat, for all surface mounted type devices with screw centers, 7/8 to 1 1/8 in.

3 1/4-in. Octagon Boxes and Covers—SP24151. Four nailholes in bottom staggered. Outlets—four in sides and one in bottom for 1/2-in. conduit, or four sides for 3/4-in. conduit and one in bottom for 1/2-in. conduit. No. SP24C1 is a flat blank cover. No. SP24C12 is a raised pendent type cover with 3/8-in. eyelet bushing. No. SP24C28 is a flat cover for all surface mounted devices; screw centers from 7/8 to 1 1/8 in. with base diameter not larger than 1 1/8 in.



SP24C1
Cover



SP24C12
Cover



SP24C28
Cover



SP24151
3 1/4-in. Octagon
Box

3 1/4-in. Octagon Box Covers



SP54151
4-in. Octagon
Box



SP54C1



SP54C3



SP54C12



SP54C28

4-in. Octagon Box Covers

SP54C1—Flat blank. SP54C3—Raised canopy type, 2 7/8-in. diam. opening. SP54C12—Raised pendent type, 3/8-in. eyelet bushing. SP54C28—Flat, for all surface mounted type devices with screw centers, 7/8 to 1 1/8 in.

G-E WIRING DEVICES

G-E Interchangeable Lampholders

GE1630
1/8-in. capGE1632
3/8-in. capGE1633
1/2-in. capGE1634
Compound
BushingGE2502
Clamp gripGE1637
Key
Lampholder
Body, 250 watts,
250 voltsGE1638
Keyless
Lampholder
Body, 660 watts,
250 voltsGE1639
Pull
Lampholder
Body, 250 watts,
250 voltsGE1640
Locking Key
Lampholder
Body, 250 watts,
250 voltsGE1641
Locking Keyless
Lampholder
Body, 660 watts,
250 voltsGE1836
Locking Pull
Lampholder
Body, 250 watts,
250 voltsGE434
Key
For locking
Lampholders

Standard finish is brush brass.

G-E Threaded Catch Caps, Bodies and Locking Bodies

GE2700
1/8-in. capGE2784
Pendant cap with
clamp gripGE2702
Pendant capGE2701
3/8-in. capGE2704
Key
Lampholder
Body, 660 watts,
250 voltsGE2705
Keyless
Lampholder
Body, 660 watts,
250 voltsGE2706
Pull
Lampholder
Body, 250 watts,
250 voltsGE2710
Push-button
Lampholder
Body, 660 watts,
250 volts

G-E Textolite Threaded Catch Caps and Bodies

GE1224
1/8-in. capGE1223
Pendant CapGE1226
Concealed BaseGE1229
3 1/4-in. Box BaseGE2237
Key
Lampholder
Body, 660 watts,
250 voltsGE1218
Pull
Lampholder
Body, 250
watts, 250 voltsGE1222
Push Button
Lampholder
Body, 660 watts,
250 voltsGE1214
Keyless
Lampholder
Body
660 watts,
250 volts

G-E Snap-Catch Porcelain Lampholder Parts

GE2581
With cover for 3 1/4-in. box

GE2583

GE2582
With cover for 4-in. box

G-E Keyless Porcelain Lampholders with Shadeholder Groove

GE155
For 3 1/4-in. boxGE088
For 4-in. boxGE2584
With cover for 4-in. box

G-E Keyless Porcelain Lampholders with Shadeholder Groove

G-E Tumbler Switches

GE2841
Porcelain box;
brown Textolite
handleGE1755
Shallow porce-
lain box
LockingGE2514
Shallow porce-
lain boxGE1757
Shallow porce-
lain box
Locking

Single-pole switches

5 amp., 250 volts; 10 amp., 125 volts

Three-way switches

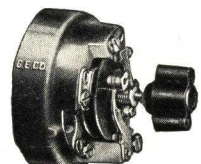
Also available in Shallow Compound Boxes, Totally Enclosed

GE2924
Double
Pole
30 amp., 250 volts
Composition boxGE2925
3-wayGE2907
Available in seventeen combinations
of units
Single Pole and 3-way—3 amp.,
250 volts
Double Pole—5 amp., 250 volts

GE2918

Flush Tumbler
Switch
Double Pole
20 amp., 250 voltsBrown Textolite
Flush Plate
1 to 4 switchesBrass Flush Plate
In brush brass or
lacquer. For 1 to
8 tumbler switches

G-E Rotary Switches

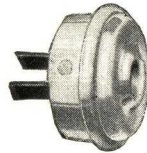
GE150
Closed Base, Indi-
cating Switch
Steel cover151394
Closed Base, Indi-
cating Switch
Cast iron coverGE2313
Closed Base Switch
Without cover

G-E Small Motor Control Rotary Switches

Triple-pole, 20 amp., 250 volts d-c. 2 hp., 250 volts. 1 hp., 550 volts.
2-hp., 250-volt switch also made in four-pole type

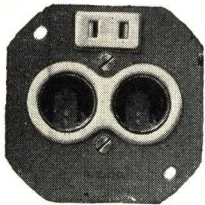
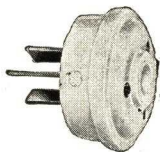
G-E WIRING DEVICES (Continued)

G-E Convenience Outlets

GE2533
SingleG-E Standard
Convenience
OutletsFor plates without
doors, wide mounting
ears, top wiredGE2534
TwinNo. 59197
Polarity Cap
Porcelain
0.6562-in. holeNo. 59200
Polarity Cap
Compound
0.6562-in. holeNo. 59198
Surface Polarity
Plug Receptacle
Porcelain, Concealed BaseGE695
Brass Flush Plate
For twin conven-
ience outletGE2315
Textolite Flush Plate
For twin conven-
ience outletNo. 49491
Brass Flush Plate
For single convenience
outlet. GE2314
TextoliteNo. 59201
Surface
Polarity Plug
ReceptacleGE996
Flush Polarity Plug Re-
ceptacle. Compound
Top, Porcelain BaseGE997
Flush Plate for 30-amp.
Polarity Plug Re-
ceptacleG-E Polarity Plug Receptacles
30-amp., 250 volts

Flush Plates for G-E Standard Convenience Outlets

G-E Plug Receptacles

GE1162
Industrial Plug
Receptacle
With fuse plug
cutout for 4-in.
outlet box
10 amp., 125 voltsGE1370
Polarity
Cap
CompoundGE1369
Surface
Polarity Plug
ReceptacleGE1368
Surface
Polarity Plug
ReceptacleGE1367
Flush Polarity Plug
Receptacle
Shallow, one-piece;
compoundG-E Polarity Plug Receptacles
20-amp., 250 voltsNo. 59192
Polarity Cap
Porcelain
0.750-in. holeNo. 59195
Polarity Cap
Compound
0.750-in. holeNo. 59193
Surface Polarity Plug
Receptacle. Con-
cealed Base
Porcelain

30-amp., 250 volts

G-E Triple-pole Polarity Plug Receptacles

G-E Fuse Plugs, Fuses and Fuse Links

Hexagonal
WindowG-E Fuse Plugs, 10 to 30-amp., 125 Volts.
Plug with hexagonal window for 10
and 15-amp. Plug with round window
for 20, 25 and 30-amp.Round
Window"Pyrex" (Reg. U. S. Pat. Off.)
Transparent Top Fuse PlugsHexagonal
WindowG-E Fuse Plugs, 3 to 30-amp., 125 Volts.
Plug with hexagonal window for
3, 6, 10, 12 and 15-amp. Plug with
round window for 20, 25 and 30-amp.Round
Window

Brass Top Fuse Plugs

G-E Enclosed Fuse
1 to 60-amp.
capacitiesG-E Enclosed Fuse
70 to 600-amp.
capacitiesG-E Enclosed
Renewable Fuse
3 to 60-amp.
capacitiesG-E Enclosed Renewable Fuse
70 to 600-amp.
capacitiesG-E Renewable Enclosed Fuse Links, Drop-out Type
3 to 600-amp., 250-volt and 600-voltN. E. CODE RUBBER-INSULATED WIRE AND CABLE FOR GENERAL
LIGHT AND POWER SERVICE—600 VOLTS MAXIMUMInsulated with Code, Intermediate or Thirty Per-cent
grades of rubber compound, and finished with braid or with
lead sheath.G-E Code grade is guaranteed to more than meet the
requirements of the Underwriters in tensile strength and insu-
lation resistance.G-E Intermediate grade is an insulation designed for those
who require an insulation of better than Code grade, but less
expensive than Thirty Per-cent grade.G-E Thirty Per-cent is the best commercial grade and con-
tains not less than 30% new rubber. The general tests are
higher than for Intermediate.Upon request we will furnish test specifications for Code,
Intermediate and Thirty Per-cent Compounds that will enable
the consumer to determine which compound best meets his
requirements. When the consumer, engineer or architect wishes
to observe these tests, we will gladly furnish the facilities at
Bridgeport where these tests may be witnessed.

Single-Conductor—Braided



Size, A.W.G.	Thickness of insulation, in.	Diam. over all, in.	Ship. wt. per 1000 ft., lb.	Standard packing
14	$\frac{3}{64}$	0.19	27	500-ft. coils
12	$\frac{3}{64}$	.21	37	500-ft. coils
10	$\frac{3}{64}$	.23	52	500-ft. coils
8	$\frac{3}{64}$	.25	74	500-ft. coils
6	$\frac{3}{64}$	.37	127	500-ft. coils
4	$\frac{3}{64}$	.42	196	500-ft. coils
3	$\frac{3}{64}$	.45	240	500-ft. coils
2	$\frac{3}{64}$	.48	290	500-ft. coils
1	$\frac{3}{64}$	.55	421	1000-ft. reels
1/0	$\frac{3}{64}$	.59	512	1000-ft. reels
2/0	$\frac{3}{64}$	.64	631	1000-ft. reels
3/0	$\frac{3}{64}$	.69	769	1000-ft. reels
4/0	$\frac{3}{64}$	.74	948	1000-ft. reels

N. E. CODE RUBBER-INSULATED WIRE AND CABLE FOR GENERAL LIGHT AND POWER SERVICE—600 VOLTS MAXIMUM (Continued)

Single Conductor—Braided (Cont'd)

Size, A.W.G.	Thickness of insulation, in.	Diam. over all, in.	Ship. wt. per 1000 ft., lb.	Standard packing
250,000CM	$\frac{5}{64}$	.82	1130	1000-ft. reels
300,000CM	$\frac{5}{64}$	.89	1340	1000-ft. reels
350,000CM	$\frac{5}{64}$	.95	1538	1000-ft. reels
400,000CM	$\frac{5}{64}$	.99	1734	1000-ft. reels
450,000CM	$\frac{5}{64}$	1.04	1933	1000-ft. reels
500,000CM	$\frac{5}{64}$	1.08	2132	1000-ft. reels
550,000CM	$\frac{5}{64}$	1.14	2362	1000-ft. reels
600,000CM	$\frac{5}{64}$	1.20	2593	1000-ft. reels
650,000CM	$\frac{5}{64}$	1.23	2790	1000-ft. reels
700,000CM	$\frac{5}{64}$	1.27	2987	1000-ft. reels
750,000CM	$\frac{5}{64}$	1.31	3192	1000-ft. reels
800,000CM	$\frac{5}{64}$	1.34	3385	1000-ft. reels
850,000CM	$\frac{5}{64}$	1.37	3587	1000-ft. reels
900,000CM	$\frac{5}{64}$	1.40	3790	1000-ft. reels
950,000CM	$\frac{5}{64}$	1.43	3984	1000-ft. reels
1,000,000CM	$\frac{5}{64}$	1.46	4178	1000-ft. reels
1,250,000CM	$\frac{5}{64}$	1.66	5288	500-ft. reels
1,500,000CM	$\frac{5}{64}$	1.78	6286	500-ft. reels
1,750,000CM	$\frac{5}{64}$	1.89	7230	500-ft. reels
2,000,000CM	$\frac{5}{64}$	2.00	8230	500-ft. reels

Lead Sheathed

Size, A.W.G.	Thickness of insulation, in.	Thickness of lead, in.	Diam. over all, in.	Ship. wt. per 1000ft., lb.	Size, A.W.G.	Thickness of insulation, in.	Thickness of lead, in.	Diam. over all, in.	Ship. wt. per 1000 ft., lb.
Solid—Single Conductor					Solid—Two Conductor				
18	$\frac{3}{64}$	$\frac{3}{64}$	.20	96	18	$\frac{3}{64}$	$\frac{3}{64}$	.34	140
16	$\frac{3}{64}$	$\frac{3}{64}$	.21	106	16	$\frac{3}{64}$	$\frac{3}{64}$	.35	153
14	$\frac{3}{64}$	$\frac{3}{64}$	.26	167	14	$\frac{3}{64}$	$\frac{3}{64}$	.45	271
12	$\frac{3}{64}$	$\frac{3}{64}$	.28	187	12	$\frac{3}{64}$	$\frac{3}{64}$	.52	442
10	$\frac{3}{64}$	$\frac{3}{64}$	.33	313	10	$\frac{3}{64}$	$\frac{3}{64}$	.56	506
8	$\frac{3}{64}$	$\frac{3}{64}$	.36	364	8	$\frac{3}{64}$	$\frac{3}{64}$	.62	598
6	$\frac{3}{64}$	$\frac{3}{64}$	.46	603	6	$\frac{3}{64}$	$\frac{3}{64}$	.78	986
4	$\frac{3}{64}$	$\frac{3}{64}$	.50	720					
Stranded—Single Conductor					Stranded—Two Conductor				
8	$\frac{3}{64}$	$\frac{3}{64}$	.38	385	8	$\frac{3}{64}$	$\frac{3}{64}$	.66	637
6	$\frac{3}{64}$	$\frac{3}{64}$	.48	634	6	$\frac{3}{64}$	$\frac{3}{64}$	.82	1038
4	$\frac{3}{64}$	$\frac{3}{64}$	.53	758	4	$\frac{3}{64}$	$\frac{3}{64}$	.93	1268
2	$\frac{3}{64}$	$\frac{3}{64}$	.59	935	2	$\frac{3}{64}$	$\frac{3}{64}$	1.05	1591
1	$\frac{3}{64}$	$\frac{3}{64}$	.67	1109	1	$\frac{3}{64}$	$\frac{3}{64}$	1.23	2198
1/0	$\frac{3}{64}$	$\frac{3}{64}$	.71	1249	1/0	$\frac{3}{64}$	$\frac{3}{64}$	1.32	2479
2/0	$\frac{3}{64}$	$\frac{3}{64}$	.76	1412	2/0	$\frac{3}{64}$	$\frac{3}{64}$	1.41	2809
3/0	$\frac{3}{64}$	$\frac{3}{64}$	.81	1619	3/0	$\frac{3}{64}$	$\frac{3}{64}$	1.52	3223
4/0	$\frac{3}{64}$	$\frac{3}{64}$	.87	1865	4/0	$\frac{3}{64}$	$\frac{3}{64}$	1.64	3718
250,000CM	$\frac{3}{64}$	$\frac{3}{64}$	.98	2410					
300,000CM	$\frac{3}{64}$	$\frac{3}{64}$	1.04	2716	Solid—Three Conductor				
400,000CM	$\frac{3}{64}$	$\frac{3}{64}$	1.14	3236	14	$\frac{3}{64}$	$\frac{3}{64}$	.54	737
500,000CM	$\frac{3}{64}$	$\frac{3}{64}$	1.23	3761	12	$\frac{3}{64}$	$\frac{3}{64}$	.58	821
600,000CM	$\frac{3}{64}$	$\frac{3}{64}$	1.38	4762	10	$\frac{3}{64}$	$\frac{3}{64}$	.66	931
700,000CM	$\frac{3}{64}$	$\frac{3}{64}$	1.45	5300	8	$\frac{3}{64}$	$\frac{3}{64}$	.72	1088
750,000CM	$\frac{3}{64}$	$\frac{3}{64}$	1.49	5549	6	$\frac{3}{64}$	$\frac{3}{64}$	.86	1684
800,000CM	$\frac{3}{64}$	$\frac{3}{64}$	1.53	5808					
900,000CM	$\frac{3}{64}$	$\frac{3}{64}$	1.60	6342	Stranded—Three Conductor				
1,000,000CM	$\frac{3}{64}$	$\frac{3}{64}$	1.65	6788	8	$\frac{3}{64}$	$\frac{3}{64}$	.76	1158
1,250,000CM	$\frac{3}{64}$	$\frac{3}{64}$	1.79	7214	6	$\frac{3}{64}$	$\frac{3}{64}$	.91	1772
1,500,000CM	$\frac{3}{64}$	$\frac{3}{64}$	1.92	8286	4	$\frac{3}{64}$	$\frac{3}{64}$	1.05	2150
1,750,000CM	$\frac{3}{64}$	$\frac{3}{64}$	2.03	9264	2	$\frac{3}{64}$	$\frac{3}{64}$	1.18	2688
2,000,000CM	$\frac{3}{64}$	$\frac{3}{64}$	2.13	10293	1	$\frac{3}{64}$	$\frac{3}{64}$	1.37	3617
					1/0	$\frac{3}{64}$	$\frac{3}{64}$	1.47	4076
					2/0	$\frac{3}{64}$	$\frac{3}{64}$	1.57	4612
					3/0	$\frac{3}{64}$	$\frac{3}{64}$	1.68	5282
					4/0	$\frac{3}{64}$	$\frac{3}{64}$	1.84	6619

Flat Twin Wire—Braided—Solid or Stranded

Has a braid on each conductor and one braid over all. This is equivalent to double braid and is suitable for unlined conduit use.



Size, A.W.G.	14	12	10	8
Thickness of insulation, in.	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$
Diam. over all, in.	.24 x .43	.25 x .46	.27 x .50	.30 x .56
Ship. wt. per 1000 ft., lb.	62	77	110	160
Standard packing	500-ft. coils			

G-E rubber insulated braided and leaded wire and cable can be supplied in three grades of rubber insulation, viz., N.E. Code Standard, Intermediate and 30% grades. Braided wire and cable is furnished in eight distinctive colors to simplify circuit testing, facilitate extension and alteration work and to save time whenever a large number of circuits are involved.

G-E braided wire and cable can be supplied with a flame retarding finish in place of the standard weather-proof finish. This finish not only provides the required protection against moisture but also eliminates fire hazard.

G-E ALL-RUBBER CORDS

G-E All-rubber Cords are designed for use on portables and appliances that are subjected to rough, hard usage. They will resist oil, acids, and moisture and will render continuous satisfactory service for a long period of time under the most severe conditions. The smooth outer surface will not collect grease or dirt.

The outer jacket is unusually tough and contains a high percentage of new Para rubber.

G-E All-rubber Cords never kink.

Type S—A heavy duty cord designed for use on tools and heavy appliances. The heavy jacket is especially resistant to the effects of oil, water and acids.



Size, A.W.G.	18	16	14	12	10	8
Thickness of insulation, in.	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$
Diam. over all, in.:						
2-conductor	.40	.41	.54	.58	.65	.74
3-conductor	.41	.44	.57	.61	.69	.76
4-conductor	.44	.49	.61	.68	.76	.95
Ship. wt. per 1000 ft., lb.:						
2-conductor	92	100	148	180	238	318
3-conductor	96	115	179	220	296	387
4-conductor	113	139	213	270	363	559
Standard packing	250-ft. coils*					

*Two-conductor, 18 and 16-gauge sizes, are packed in 250-ft. spools.

Single-Conductor Wire for Fixtures—Weatherproof

Size, A.W.G.	20	18	16	14	12
Thickness of insulation, in.	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$
Diam. over all, in.:					
Solid	.09	.10	.13	.11	.14
Stranded	.11	.12	.15	.13	.16
Ship. wt. per 1000 ft., lb.:					
Solid	8	10	14	14	18
Stranded	9	11	15	14	19
Standard packing (spools)	1000'	1000'	500'	1000'	500'

C-F Fixture Wire, a flexible, heat resisting wire for wiring weather tight fixtures and those located in dry places, is also available.

Type SJ—Same construction as Type S except that it has a lighter over all rubber jacket and is suitable for less severe service.

Type SJ-JR—Same construction as Type SJ except that the over all rubber jacket is lighter. This cord is suitable for use on floor lamps, adding machines, calculators and dictating machines.

Type SJ Special—Similar in construction to Type SJ, and is suitable for use on appliances where the appearance of the outer jacket is not an important factor.

Size, A.W.G.	Thickness of insulation, in.	Diam. over all, in.		Ship. wt. per 1000 ft., lb.		Standard packing
		Type SJ, 2-cond.	Type SJ, 3-cond.	Type SJ, 2-cond.	Type SJ, 3-cond.	
18	$\frac{3}{64}$	.30	.33	60	67	*
16	$\frac{3}{64}$	.34	.37	73	86	*
		Type SJ-JR, 2-cond.	Type SJ Special, 2-cond.	Type SJ-JR, 2-cond.	Type SJ Special, 2-cond.	
18	$\frac{3}{64}$	.29	.30	59	50	*
16	$\frac{3}{64}$	.32	.32	70	60	*

*Type SJ, 2-conductor and Type SJ-JR, 2-conductor are supplied on 250-ft. spools; all others are 250-ft. coils.

Lamp Cords and Portables

A complete line of lamp cords, portables and telephone wires is carried in stock at all times.

ESTABLISHED 1904

SCHWARZE ELECTRIC CO.

Schwarze Specialized and General Service Sound Signals and Accessories
ADRIAN, MICH.
OFFICES IN PRINCIPAL CITIES

Products

BELLS, BUZZERS, HORNS, SIRENS, KODE-KALL.
Pioneer manufacturers of non-arcing, polarized, non-contact, plunger type alternating-current bells and buzzers.

Characteristics

Accessible, simplified, rugged construction; symmetrical design; labor-saving installation; integral conduit connections; low current consumption; low initial cost; weatherproof; long-lasting, dependable performance.

Frame finish: Regular, black; fire duty, red.
Gong finishes: Special Steel—parkerized black, nickel plated or galvanized; Cast Bell Metal—lacquered or oxidized.

SCHWARZE

Applications and Uses

Schools, institutions, residences, apartments, hospitals, public buildings, office buildings, industrial plants, mines, railroads, shipping, stores, construction projects, etc. Fire, sprinkler, burglar, hold-up, switchboard, powerhouse and engine room alarm systems; code paging and program clock systems; traffic control; special signaling systems; elevators; tanks; automatic control system, etc. Indoors and out, light and heavy duty.

Installation Data and Engineering Service

Installation data, roughing-in and mounting dimensions, resistance tables, current requirements and wiring diagrams furnished on request. *Write today for complete catalogue.*



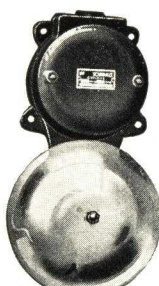
No. 700 Series
(Reg. U. S. Pat. Off.)

Famous "Cyclone" Vibrating Bells

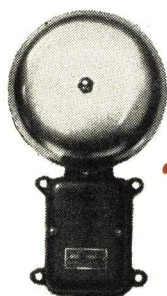
Up to 14-in. gong diameter. Weatherproof, loud ringing. For class rooms, corridors, yard use and general service.

No. 700 Series—For a-c. No contacts. Polarized. For use on transformer or high voltage, 25 or 60-cycles.

No. 6F—For 6 volts and higher d-c.



No. 6F



No. 37

Single Stroke Heavy Duty Bells

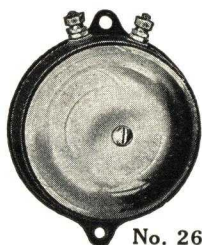
Plunger type, 6 volts and higher. No contacts. Weatherproof.

No. 37A—For a-c.

No. 37D—For d-c.

Sizes up to 12 in. For code signaling, announcement, fire alarm, etc.

No. 26—3-in. bell metal gong. For 6 volts and higher a-c. or d-c. Mellow and distinct. For call signals. Concealed terminals, standard. Interior use. Ideal for door bell.



No. 26

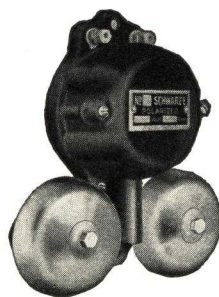
Double Gongs

Ideal for class rooms, corridors and general service.

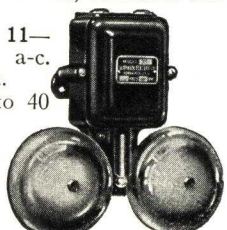
Nos. 9 and 11—6 to 220 volts a-c. Gongs up to 10 in.

No. 35—Up to 40 volts d-c.

Nos. 22 and 23—Up to 220 volts. Gongs up to 16 in. For general fire alarm use, d-c. only.



Nos. 9 and 11



No. 35

Heavy Duty Buzzers

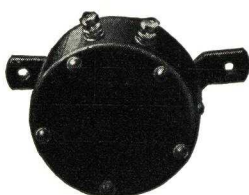
No. 16—Non-contact, polarized. Up to 220 volts a-c. General purpose. Subdued signal.

No. 36—Non-arcing; up to 40 volts d-c. Subdued.

No. 11—Diaphragm type; up to 220 volts a-c. 110 volts d-c. For elevators, taxis, buses, etc. Loud.



Nos. 16 and 36



Nos. 11ED and 11EA

Standardized General Service Vibrator Horns

Type 18, A-c. Only, and Type 3, A-c. and D-c.—

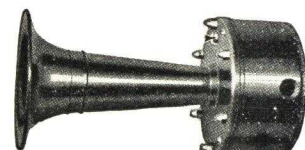
Common Features—Heavy duty; weatherproof or non-weatherproof; surface, 1/2-in. conduit or outlet box mounting; megaphone, two-way and three-way styles.

Optional Finishes—Regular, black. Fire Duty, red.

Type 18 Synchronous Vibrator Horns—Any voltage up to 220 volts, a-c. only. Non-contact, non-sparking, series or multiple circuits. Outside adjustment. For fire alarm, code paging or general service. Specify 18-WP for outdoor service.

Type 3 Contact Type Vibrator Horns—Any voltage up to 220 volts a-c. or d-c., parallel circuits only. Heavy duty tungsten contacts. Ideal for code signaling, fire alarm or general service. Specify 3-A for a-c., 3-D for d-c., 3-WP (A or D) for outdoor service.

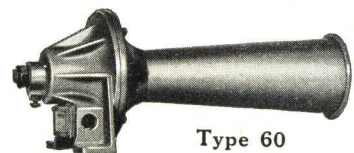
Type 60 Giant Vibrator—For 110 to 220 volts a-c. only. 1/2-in. conduit connection integral with terminal box. A powerful, penetrating, far-reaching signal—an ideal alarm call. Weatherproof. Finish—black or red.



Megaphone Style



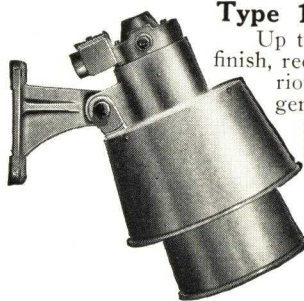
3-Way Style



Type 60

Type 150 Siren

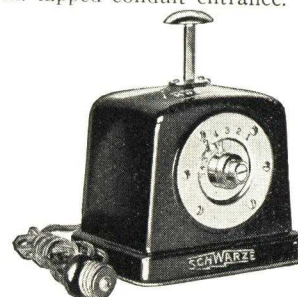
Up to 220 Volts a-c. or d-c. Standard finish, red enamel. Tilting bracket. For fire, riot, starting, dismissal or any emergency signaling purpose. Powerful, penetrating, instantaneous, weatherproof. High speed, ball bearing motor. Integral terminal box with 1/2-in. tapped conduit entrance.



Weatherproof Siren

Man-finding Kode-Kall

A simple, economical, dependable, automatic paging device. Calls 30 different people. Repeats signals three times. As easy to install as a push button. Special bulletins on request.



Kode-Kall

Accessories

Manual trips; protective, screened housings; full gong guards; hanger plates; woodmats; breakglass stations; concealed bell-buzzer combinations; transformers, relays, etc.

CHICAGO WATCHMAN'S CLOCK CO.

TELEPHONE
Calumet 1809

1526 South Wabash Avenue
CHICAGO, ILL.

BRANCH OFFICES IN PRINCIPAL CITIES

Chicago Watchman's Clock System

Listed and labeled by the Underwriters' Laboratories, Inc., and by the Factory Mutual Laboratories. This system embodies distinctive points of construction and exclusive methods of registration endorsed by engineers.



Clock in Leather Case Ready for Service

It consists of the clock, the leather carrying case, the required complement of stations with seals and a year's supply of dial record sheets.

The system is so devised that the clock must be carried by the watchman on his regular rounds at stated intervals to the patrol stations, each station having a key which fits the clock. When this key is inserted and turned it registers on a paper dial within the clock, in an embossed figure, the exact time of registry.

The keys are chained and sealed at the various

stations, making it impossible to remove them without detection. The clock, while in the possession of the watchman, is locked and is equipped with a telltale device which records the exact time of every opening and closing of the clock upon the paper dial.

By keeping the locking key and the supply of used and unused dials inaccessible to the watchman, he can not open the clock or otherwise examine or tamper with his records without being detected. The user of a spurious key can never know the result of his attempts, yet each is recorded upon the paper dial and will be discovered on the following morning.

A Few of Many Advantages

It Is a Flexible System—Every Chicago Clock is built to serve sixteen or more stations, although additional stations can be furnished as needs require, without interruption of service. It is only necessary to send us the serial number of the clock and the number of additional stations desired.

Improved Station Boxes—While the standard drop cover box can be furnished if desired, it is recommended that lock box stations be installed. The slight additional cost is more than compensated by the fact that the registering keys are protected from theft or damage. Should an occasional inspection of the system show any attempt at mutilation of the keys or chain, the watchman can properly be charged with it as no one else has access to the box.

Flush Type Box—This type of box can be furnished if desired.

Positive, Clean Registration—The record or registration on the dial is obtained by bringing together a male and a female die upon the record sheet which lies between them and upon which the record is embossed. The male die is not a part of the key but of the mechanism contained in the clock case, where it is secure against injury or tampering. It is made of rustproof non-corrosive metal. As a result, the embossed record will be as clear-cut after ten or twenty years of use as when new.

Each key embosses on the paper dial a distinctive figure, tamper-proof and different from

that of every other key. Only a firm pressure is required to produce a perfect impression. These keys are all made of rustproof, non-corrosive metal. With the Chicago System, the dials can not be manipulated, nor missed stations filled in, except by actually taking the clock to the stations at the exact time to be registered.

Keys Not Interchangeable—No two keys in the Chicago System are interchangeable, nor can the key of one clock be used in another clock of the same make, which is an advantage where a large system requiring more than one clock is in operation. Duplicate keys can not be supplied except upon official order of the user and only from dies in our own plant.

Construction

Carrying Case—Only the finest 8-ounce oiled harness leather used, waterproofed and hand-sewed to increase the life and durability of this part.

Clock Case—One of the exclusive features of the Chicago Clock is its die-cast aluminum case. Very light, strong, non-corrosive, and practically indestructible, it is so designed that the registering mechanism and the clock movement it contains are entirely separated and protected from dust, dampness and jarring.

Movement—The only clock on the market equipped with an 8-day movement, full jeweled; this is built exclusively for us by the Waltham Watch Co. The short pinions and nickel

movement plates are similar to those found in automobile clocks and other sensitive devices from which accurate service under severe conditions is demanded.

Record Sheet—The paper dials are usually arranged for twenty-four hours to provide a record for Sunday and holiday registering, without any one having to go to the plant on those days to change the dials. Twelve-hour dials may be had, if desired.

Easy to Install

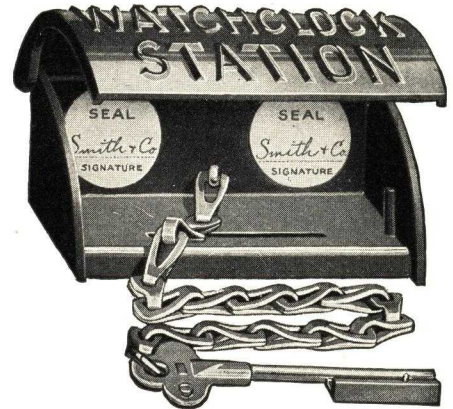
To install, only an hour or two is required for putting up the stations, which can be shifted or relocated at any time at the slight trouble of replacing the seals that will be furnished without charge.

Trial Offer

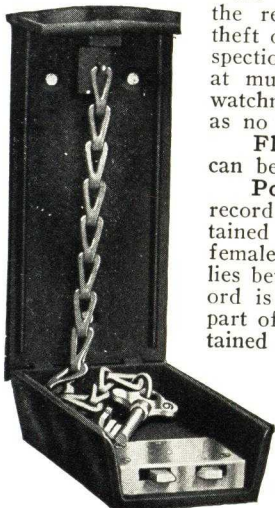
Sent on approval to any point in the United States to be judged on its merits.

Users of This System

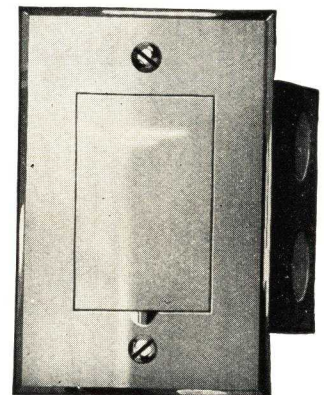
Chicago Systems are giving satisfactory service in many of the largest industrial, mercantile and business buildings of the country, such as Marshall Field & Company, Pittsburgh Plate Glass Company, Standard Oil Company and others.



Standard Drop Cover Box without Lock



Lock Station Box Open



Flush Type Station Box

INDUSTRIAL INSULATION

Sound, Heat, Cold and Vibration

THE PHILIP CAREY COMPANY

Manufacturers of Heat Insulation

LOCKLAND, CINCINNATI, OHIO

BRANCHES AND DISTRIBUTORS IN PRINCIPAL CITIES

FACTORIES: LOCKLAND, OHIO, AND PLYMOUTH MEETING, PA.

Products

ASBESTOS and MAGNESIA PIPE COVERING and INSULATION.

Also Insulating and Refractory Cements, Roof and Metal Protective Paints, and Asbestos Products of all kinds.

For Asphalt Plank, Built-up Roofing, and Asbestos-Cement Corrugated Roofing and Siding, see Manufacturers' Index.

Service

Branch offices or exclusive distributors in all principal cities can furnish and apply Carey materials.

THE PHILIP CAREY COMPANY maintains a heat insulation engineering department with a corps of competent engineers and is prepared to give individual engineering service on any heat insulation problem. It also maintains a research fellowship on heat insulation in the Mellon Institute of Industrial Research, University of Pittsburgh, where all data pertaining to the performance of its products are obtained. All insulating values specified for Carey heat insulating materials are based upon the findings of this impartial institution, where many of the Carey heat insulations have been scientifically developed to give maximum results for various service conditions.

Note: The economic thickness of heat insulating material depends upon the cost of heat. The Carey standard recommendations given here are based upon heat at 40¢ per million B.T.U. and upon the Mellon Institute economic thickness curves as shown for this cost. Further data on economic thickness for other costs of heat will be furnished on request.

Carey Carocel Heat Insulation

Carey Carocel heat insulation consists of fine corrugated asbestos sheets firmly bound together, 8 plies to the inch. It has relatively high insulating value at relatively low cost, at temperatures up to 400° F., but is not recommended for use above 250° F. because more efficient materials for the higher range are available.

Furnished in the form of sections and segments for pipe covering, also flat blocks 6x36 in., and in sheets 36x36 in.

CAREY CAROCEL HEAT INSULATION

Savings in B.T.U. per Sq. Ft. per Hour from Flat Surface

Thickness	Temperature difference from hot surface to air		
	100° F.	200° F.	300° F.
1 in.	157	392	740
1½ in.	166	414	777
2 in.	173	427	799

Carey Multi-Ply Heat Insulation

Carey Multi-Ply heat insulation consists of successive laminations or layers of pure asbestos paper containing fine cross indentations, the layers being firmly bound together with strips of fireproof binder. This covering is most efficient and economical in the range of 250° to 400° F. The laminated construction makes it strong and tough, so that it can stand a great deal of abuse without damage, making it very desirable for use as a steam pipe covering in manufacturing plants.

Furnished in the form of sections and segments for pipe covering, also flat blocks 6x36 in., and in sheets 36x36 in.

CAREY MULTI-PLY HEAT INSULATION

Savings in B.T.U. per Sq. Ft. per Hour from Flat Surface

Thickness	Temperature difference from hot surface to air				
	100° F.	200° F.	300° F.	400° F.	500° F.
1 in.	167	413	776	1286	1973
1½ in.	172	427	799	1322	2037
2 in.	177	434	815	1344	2054
2½ in.	179	442	825	1359	2073
3 in.	182	447	832	1369	2087

Carey 85% Magnesia

Carey 85% Magnesite heat insulation consists of approximately 85% carbonate of magnesia and 15% asbestos fibre. It is primarily a high pressure steam insulation intended for temperatures up to 550° F., but should not be used beyond that except as an outer layer over a heat resisting inner layer.

Furnished in the form of sections and segments for pipe covering, also flat blocks 6x36 in.

CAREY 85% MAGNESIA

CAREY 85% MAGNESIA
Savings in B.T.U. per Sq. Ft. per Hour from Flat Surface

Thickness	Temperature difference from hot surface to air				
	100° F.	200° F.	300° F.	400° F.	500° F.
1 in.	159	400	759	1265	1949
1½ in.	168	420	791	1313	2016
2 in.	173	431	808	1338	2048
2½ in.	177	438	819	1353	2068
3 in.	179	443	827	1364	2082

Carey Hi-Temp No. 12 Heat Insulation

Carey Hi-Temp No. 12 heat insulation is a product developed at the Mellon Institute specifically for the insulation of temperatures in the range of 600° to 1000° F., where it is used as a first layer to reduce temperatures within the range of better insulations. In combination with equal thickness of Carey Superheat Magnesia, the rate of heat loss does not exceed that of straight 85% magnesia by more than 10%. This material is very strong and relatively light.

Furnished in the form of sections and segments for pipe covering, also flat blocks 6x36 in.

Heat Insulation Recommendations

Temperatures	Pipe sizes	Kind and thickness of heat insulation	
150 to 250 F.	$\frac{1}{2}$ to 6 in., incl. 7 in. and larger	1- in. Carocel 1½-in. Carocel	
250 to 300 F.	$\frac{1}{2}$ to 2 in., incl. 2½ to 10 in., incl. 12 in. and larger	Standard Multi-Ply 1½-in. Multi-Ply 2- in. Multi-Ply	
300 to 400 F.	$\frac{1}{2}$ to 2 in., incl. 2½ to 10 in., incl. 12 in. and larger	1½-in. Multi-Ply 2- in. Multi-Ply 2½-in. Multi-Ply	
400 to 550 F.	$\frac{1}{2}$ to 2 in., incl. 2½ to 4 in., incl. 4½ to 10 in., incl. 12 in. and larger	1½-in. 85% Magnesia 2- in. 85% Magnesia Double standard 85% Magnesia 3-in. 85% Magnesia	
*550 to 750 F.	$\frac{1}{2}$ to 1½ in., incl. 2 to 3 in., incl. 3½ to 4½ in., incl. 5 to 8 in., incl. 9 in. and larger	First layer, Hi-Temp No. 12	Second layer, Carey 85% Magnesia
		1½ or 2 in. 1 in. 1½ in. 1½ in. 1½ in.	None 1½ or 2 in. 1½ or 2 in. 1½ or 2 in. 2 or 2½ in.

*Use the lesser thicknesses for temperatures of 550° to 650° F., and the greater thicknesses for temperatures of 650° to 750° F.

Note: The terms "standard" and "double standard" as applied to Magnesite coverings refer to thicknesses specified in the following table:

Pipe size.....in.	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$
Std. thickness.....in.	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$1\frac{1}{32}$	$1\frac{1}{32}$	$1\frac{1}{32}$	$1\frac{1}{32}$
Dble. std. thickness.....in.	$1\frac{29}{32}$	$1\frac{29}{32}$	$1\frac{29}{32}$	$1\frac{29}{32}$	$1\frac{29}{32}$	$2\frac{5}{16}$	$2\frac{5}{16}$	$2\frac{5}{16}$	$2\frac{5}{16}$

Pipe size.....in.	4	4½	5	6	7	8	9	10	12 and larger
Std. thickness.....in.	1⅛	1⅛	1⅛	1⅛	1¼	1¼	1¼	1¼	1½
Dble. std. thickness.....in.	2¼	2¼	2⅝	2⅝	2½	2½	2½	2½	3

INSULATING PRODUCTS COMPANY

MAIN OFFICE AND FACTORY
AURORA, ILL.

AKRON, OHIO, 435 W. Market Street
BALTIMORE, MD., 109 E. Pleasant Street
BOSTON, MASS., 34 Midway Street
CHICAGO, ILL., 332 So. La Salle Street
CINCINNATI, OHIO, 1507 Elm Street
DES MOINES, IOWA, 316 S. W. 9th Street
DETROIT, MICH., 402 Donovan Building
EVANSVILLE, IND., 16 Furniture Building

HOUSTON, TEX., 2211 Walker Avenue
KANSAS CITY, MO., 2732 Cherry Street
LOS ANGELES, CALIF., 114 W. 17th Street
MILWAUKEE, WIS., 116 So. 2nd Street
MINNEAPOLIS, MINN., 117 27th Ave., S. E.
MOBILE, ALA., 8 No. Water Street
NEW ORLEANS, LA., 1601 Julia Street
NEW YORK, N. Y., 40 E. 41st Street

PHILADELPHIA, PA., Terminal Commerce Building
PITTSBURGH, PA., 604 Chamber of Commerce Bldg.
ST. LOUIS, MO., Syndicate Trust Building
SALT LAKE CITY, UTAH, So. Fifth West Street
SEATTLE, WASH., 215 Walker Building
SAN FRANCISCO, CALIF., 525 Market Street
TULSA, OKLA., 1 No. Boulder Street
YOUNGSTOWN, OHIO, 1508 Central Tower Building

FOREIGN

HONOLULU, HAWAII, Edwin A. Rogers, Pier 11

BUENOS AIRES, ARGENTINA, S. A., Pryce & Co., Peru 257

TORONTO, ONTARIO, CANADA, 48 Abell Street

WEBERS "48" INSULATING CEMENT

The INSULATING PRODUCTS COMPANY are the pioneers in the manufacture of a quality high temperature insulating cement, and since our beginning Webers "48" Insulating Cement has been a comparison for other cements. The superiority of our Webers "48" is due mainly to the basic material being a silky, silver slag wool fibre manufactured by our special process.

This mineral fibre will withstand temperatures up to 1800° F., and is of such a fine texture, so soft, tough and flexible, that it will not irritate the hands of workmen, nor break down under conditions of vibration or tension, nor will this fibre in the resultant mixture of Webers "48" pit, corrode or injure equipment to which it is applied.

To the best of our knowledge we are the only manufacturer of a fibre of this type, with such high qualities as Aurora Fibre.

When low conductivity, long life and economy are required, Webers "48" and other products manufactured with this same fibre should be specified.



Characteristics of Webers "48" Insulating Cement—An all-purpose plastic heat insulating cement, efficient up to 1800° F. Specified and used for the largest steam plant in existence today, and by many other large users of insulating materials.

(1) **Ease of Preparation and Application**—Simply add fresh water and apply to any clean surface.

(2) **Exceptionally Efficient**—Forms a monolithic construction that adheres without cracks or joints. No undetermined convection heat losses.

(3) **Large Covering Capacity**—100 lbs. (2 bags) cover 50 sq. ft. 1 in. thick.

(4) **Adhesiveness**—Grips tenaciously to any clean surface—hot or cold.

(5) **Resilient**—Due to fibre composition has sufficient elasticity for normal expansion and contraction strains. Will not flake off, is dielectric and unaffected by acid fumes.

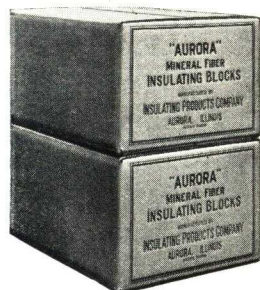
(6) **Lightness in Weight**—Thereby imposing negligible strain on parts which are insulated.

(7) **Simplifies Storage**—Instead of stocking several kinds of insulating materials, you stock one—Webers "48."

(8) **Reclamation**—Up to 1000° F. Webers "48" may be removed, remixed with fresh water and reapplied.

AURORA "48" HEAT INSULATING BLOCKS

Aurora Block is manufactured from the same silky non-irritating silver slag mineral wool fibre that is used in our Webers "48" Insulating Cement.



(1) **Ease of Application**—May be applied in the usual manner, or better still, by using our Aurora Mineral Paste, thereby adhering our blocks to the surface and eliminating the use of a cable under spring tension to hold the blocks in place until re-enforced.

(2) **High Thermal Efficiency**—Heat conductivity extremely low, requires less thickness than 85% magnesia and other blocks to effect the same heat saving.

(3) **Eliminates Convection Heat Losses at Joints**—These fibre blocks are compressible and slightly flexible, thereby permitting expansion and contraction with hot surfaces. The faces of the adjacent blocks interlock and compress to leave no cracks between blocks.

(4) **Light Weight**—The fine fibres entrap a large volume of dead air space—each fibre is 1/200th the diameter of a horse hair. The blocks contain 85% air space and only weigh 19 lbs. per cu. ft.

(5) **Resists Vibration and Soundproof**—Aurora "48" blocks do not pulverize when subjected to vibration and due to its porous nature tend to dampen equipment vibration and deaden all sounds.

(6) **Withstands Extreme Temperatures**—Aurora "48" blocks are guaranteed to withstand temperatures up to 1800° F. constantly without disintegrating, or fusing. Aurora blocks are 100% mineral, having no organic substances that may carbonize or decay, thereby weakening the blocks.

Economical Thickness to Apply Webers "48" Insulating Cement and Aurora "48" Blocks for Various Hot Side Temperatures

Hot side	Thick, in.	Hot side	Thick, in.
150° F.	3/4	500° F.	2 1/2
200° F.	1	600° F.	3
300° F.	1 1/2	800° F.	4
400° F.	2	1000° F.	5

OTHER AURORA PRODUCTS

Aurora "39" Insulating Cement.
Aurora Waterproof Mineral Cold Blocks.
Aurora Asbestos Cement.

Aurora Insulation Weather-coat.
Aurora Emulsified Asphalt Weatherproofing.
Aurora Thermo Packing Fibre.

Aurora House Insulation Fibre.
Aurora Pipe Covering.
Aurora Mineral Paste.

Samples and Engineering Data furnished upon request

THE EAGLE-PICHER LEAD COMPANY

A Complete Line of Effective High Temperature Insulating Materials

GENERAL OFFICES
CINCINNATI, OHIO

BRANCHES IN ALL PRINCIPAL CITIES

For our catalogue on Lead Pigments for Paint, see Manufacturers' Index

EAGLE "66" INSULATING CEMENT

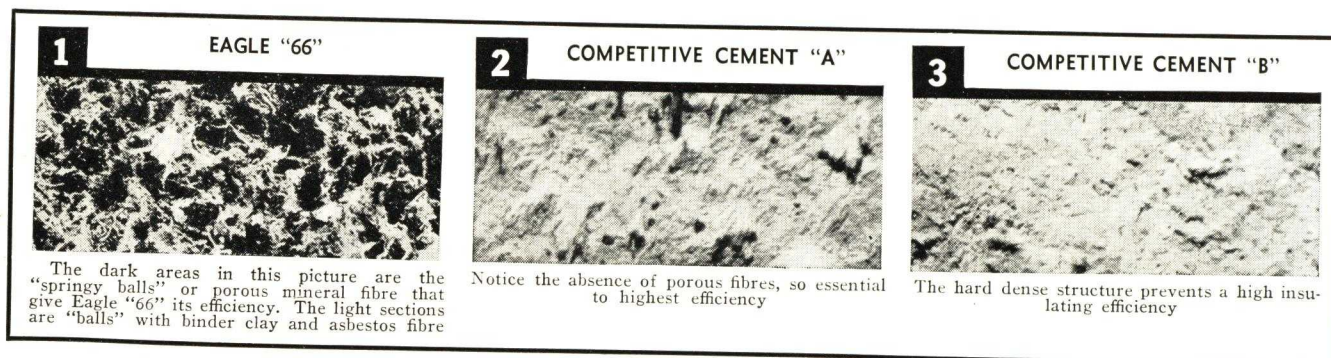
Among the many insulating products made by THE EAGLE-PICHER LEAD COMPANY, one of the most important contributions is Eagle "66" Insulating Cement. This is a new type of plastic insulation embodying a new principle of "springy ball" construction. These "springy balls," small in size, each contain thousands of tiny air cells, providing an exceptionally high heat-saving efficiency.

The balls remain intact after the cement has been mixed with water, applied and dried.

The advantages of Eagle "66" Cement are listed in detail in

the following paragraphs. Briefly, it forms a continuous, one-piece insulation that sticks firmly to a hot surface. There are no joints or seams to open up. Repairs are quickly, economically made. Application is easy, economical. It can be done with your own workmen in their idle hours. Only one material is needed for the job. Eagle "66" is exceedingly strong—and 100% reclaimable.

Many of the advantages of Eagle "66" will be apparent by examination and trial of a free sample. We will gladly send such a sample with full information.



The three microphotographs above offer an interesting comparison of the physical structures of three well known brands of cement—in actual use. They serve to illustrate the characteristic "springy ball" construction of Eagle "66." The three cements were mixed with water to the proper working consistency and cast into separate blocks. After these blocks were thoroughly dry, they were sawed through the center so as to expose the average structure of the cements. The microphotographs shown were then made from the sawed faces at 10 magnification.

Advantages of Plastic Insulation (With Eagle "66" Insulating Cement) Over Block Insulation

1. Plastic Insulation sticks to a hot surface, becoming an efficient one-piece insulation—with no seams or joints to open up to escaping heat. Blocks often pull away—shrink and open up.

2. Eagle "66" Cement offers greater ease and economy of application. Often can be applied for one-half labor cost of block, using your own workmen. This gives greater control over work, as well as economy. Cement goes on easier around corners and over irregular surfaces.

3. With cement only one material is needed, and no special tools. With blocks you need several accessories—including a finishing cement.

4. After it is applied Eagle "66" insulation is several

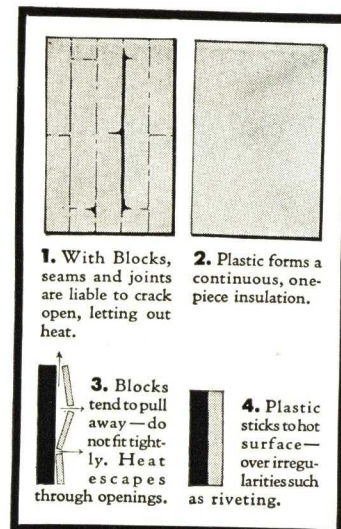
times stronger than a section of block.

5. Repairs, changes and alterations are much easier and less expensive.

6. No loss from breakage with Eagle "66."

7. It is 100% reclaimable.

8. With all these advantages, plastic (with Eagle "66") is no more expensive than block.



Eagle "66" Is Setting a New Standard for Heat-saving Efficiency

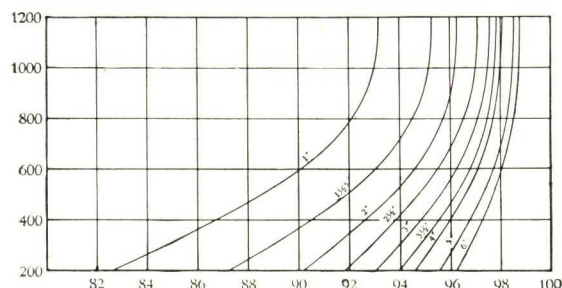


Chart No. 1

Efficiency or per cent of heat saved by various thicknesses of Eagle "66"

Recommended Thickness of Eagle "66" Insulating Cement

Operating temperatures	100—325° F.	Thickness	1½ inches
	325—550° F.		2½ inches
	550—750° F.		3½ inches
	750—950° F.		5 inches
	950—1200° F.		6 inches

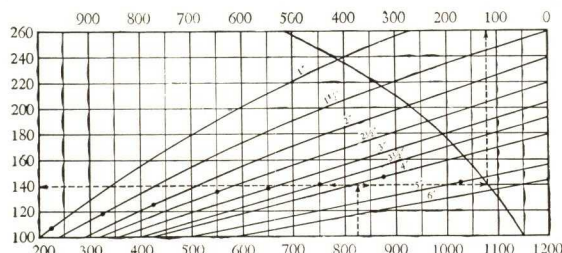


Chart No. 2

Heat loss through Eagle "66" and difference in inner and outer surface temperature readings. This chart shows the remarkably low heat transmission rate of Eagle "66" as used for various hot surface temperatures from 200° to 1200° F. Note the difference between the temperatures of the hot surface and the outside face of the insulation, as indicated by the several thickness curves.

To Determine Eagle "66" Covering for an Outside Temperature (Chart No. 2)

Temperature of hot surface 825° F. What covering thickness will give about 140° F. on cold face of Eagle "66"?

Follow the 825° F. line vertically upward until it meets the 140° horizontal line. Nearest covering line is 4-in. Thus a 4-in. covering of Eagle "66" is needed.

EAGLE INSULSEAL (WATERPROOFING CEMENT)

Insulseal is a durable coating for protecting all kinds of heat insulation against disintegration and loss of insulating value, through the effects of infiltration of air, moisture, water or fumes, or the effect of vibration. It is made in two consistencies: (1) *Summer*, (2) *Winter*. *Winter* Insulseal should be specified if temperatures during application may be below 40° F.

Insulseal should not be confused with the many asphalt and tar base plastics of which but a very few are really suitable for weatherproofing insulation. Most of these materials are of a thin, sticky consistency, which run or sag on vertical surfaces; also they penetrate the insulation to a considerable depth, thereby impairing its efficiency. Many are inflammable and their use sets up a fire hazard.

Pertinent Insulseal Facts

1. Unusual durability under severe weather conditions.
2. Toughness and elasticity which prevent cracking under changes in temperature.
3. Does not penetrate insulation.
4. Safe—contains no volatile oils and does not increase fire hazard. Insulseal will burn if exposed to a severe fire, but has

no tendency to carry flame or support combustion. Burning will discontinue when the source of fire is removed.

5. Suitable for outside temperatures of insulation up to 450° F.
6. Ready-mixed—easily and quickly applied.
7. Does not run or sag on vertical surfaces.
8. Advantageously and economically displaces canvas.
9. Finishes smooth. On heated surfaces it develops a jet black color. When not exposed to heat it dries to a grayish black.
10. Will take paint readily.
11. Covering capacity approximately 55 sq. ft., ¼-in. thick per 100 lbs.
12. Weight 9½ lbs. per gal. Packed in 50-lb. pails and 150, 300 and 500-lb. drums.

Application

Apply Insulseal as follows:

Fill all cracks and holes in the insulation completely with Eagle "66" Cement, then apply Insulseal ¼-in. thick and trowel to a smooth finish.

After drying, the thickness of Insulseal will be approximately ⅛-in. thick. A lighter coat should not be used. The shrinkage is due to dehydration, which completely seals all pores and effectively waterproofs the insulation.

EAGLE STA-LASTIC (BOILER SETTING CEMENT)

Eagle Sta-Lastic is a composition of specially treated asbestos fibre, asphalt, non-drying oils and a perfected non-oxidizing agent. The combination is a tough, plastic, adhesive substance that is airproof, waterproof, and heat-resisting. It is easily applied cold with a trowel, and adheres firmly to curved surfaces and joints where a less plastic material would be unsuitable.

Eagle Sta-Lastic prevents air infiltration through brick boiler settings. It increases combustion efficiency and reduces fuel costs in many cases as much as 10%. It will not crack, check

or peel away from the setting. It weighs approximately 10 lbs. to the gallon, is free from foreign, non-useful fillers, spreads on smoothly and will keep indefinitely in the package.

Colors

Eagle Sta-Lastic is furnished in black, gray or red colors.

Coverage

Eagle Sta-Lastic covers 200 sq. ft. per 100 lbs. It is packed in 25, 50, 100, 300 and 500-lb. drums.

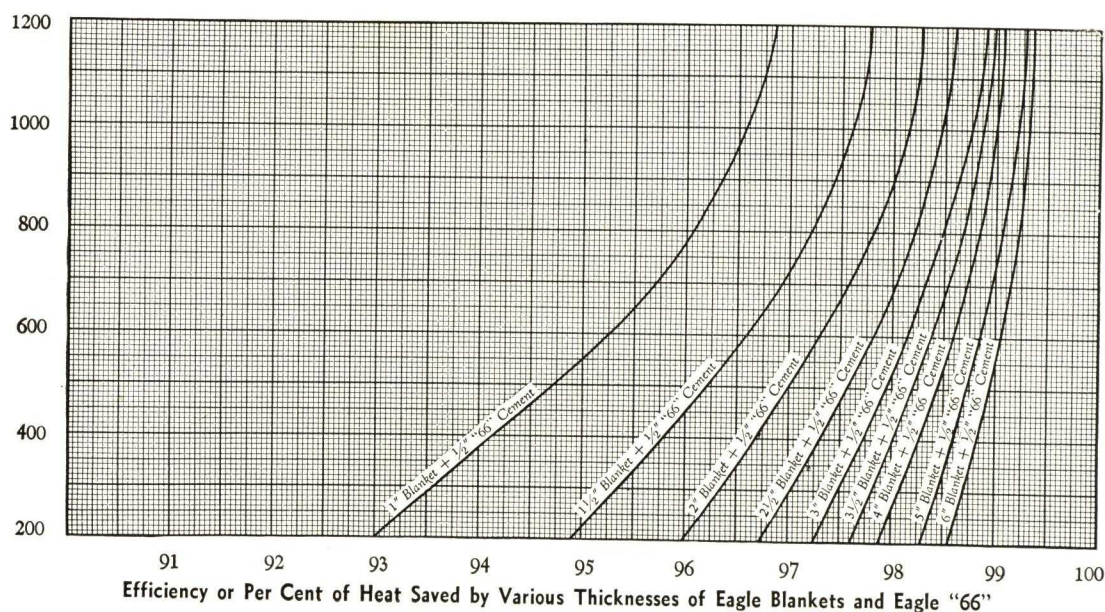
EAGLE BLANKET INSULATION

Eagle Blanket Insulation is a flexible product, composed of Eagle Insulating Wool carefully felted and secured between metal fabrics of various types. It is economical and efficient for the insulation of boilers, breechings, oil refinery equipment, ovens, furnaces and for all similar purposes where it will be subjected to temperatures not over 1200° F. It is also an ideal insulation for oil storage tanks and tank cars.

The felted Eagle Blankets are of various types, depending upon the use to which the material is to be put. The metal fabrics used are 1-in. galvanized wire netting, copper-bearing stucco lath, heavy copper-bearing expanded metal lath, $\frac{3}{8}$ -in. rib lath, and $\frac{3}{4}$ -in. rib lath. Copper-bearing lath and copper tie wires are used exclusively on all styles except No. 200 because of their rust and heat-resisting properties.

Advantages of Eagle Blanket Insulation

1. One of the most efficient high temperature insulations available for large surfaces.
2. Will resist effects of continuous exposure to high temperature.
3. Flexible and strong—not easily damaged in shipment and handling—will withstand vibration and much more abuse than block and other types of moulded insulation.
4. Lighter—resulting in saving in transportation cost.
5. Fewer joints and lower cost of application.
6. No shrinkage and is unaffected by expansion and contraction of hot surfaces.
7. No extra wire netting or other metal fabric required to retain in place—no extra material necessary to obtain air space between hot surface and insulation.
8. If rigidity is required, blankets with either $\frac{3}{8}$ -in. or $\frac{3}{4}$ -in. hirib metal lath are used.



STANDARD TYPES OF EAGLE BLANKETS

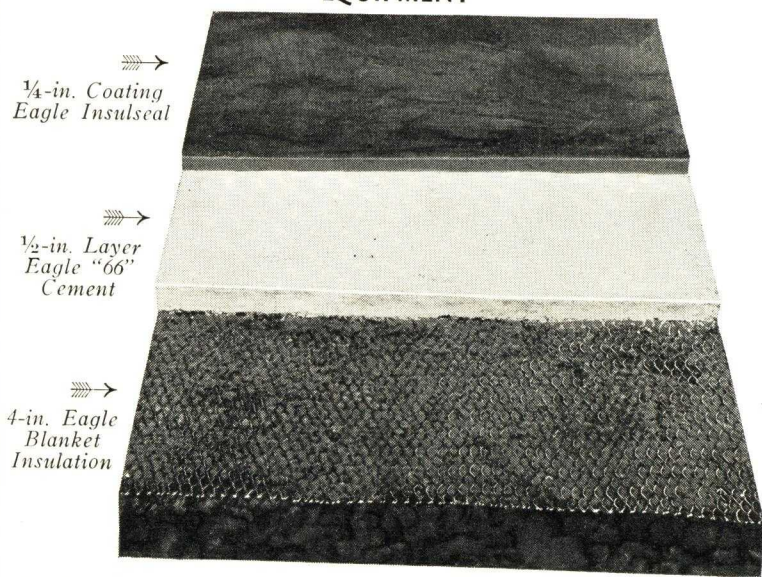
Style No.	Type of Metal Fabric
200	1-in. wire mesh on both sides
200-A	Stucco lath on both sides
201	Stucco lath and expanded lath
202	Expanded lath on both sides
203	Stucco lath and $\frac{3}{8}$ -in. rib lath
203-A*	Same as No. 203 except rib turned out
204	Expanded lath and $\frac{3}{8}$ -in. rib lath
204-A*	Same as No. 204 except rib turned out
205	Stucco lath and $\frac{3}{4}$ -in. rib lath
205-A*	Same as No. 205 except rib turned out
206	Expanded lath and $\frac{3}{4}$ -in. rib lath
206-A*	Same as No. 206 except rib turned out

*In many industries, there is a demand for an air space between the insulation and the hot surface. These blankets are especially designed to meet such a need. The turned out rib provides the required air space.

Eagle Blankets are furnished in standard sizes 24x96 and 24x48 in., and in thicknesses of 1, 1 1/2, 2, 2 1/2, 3, 4, 5 and 6 inches. Eagle Blankets can also be manufactured in such special sizes and thicknesses as the trade may call for.

All Eagle Blankets are crated, regardless of quantity or method of shipment.

RECOMMENDED METHOD OF INSULATING VERTICAL EQUIPMENT



JOHNS-MANVILLE



JOHNS-MANVILLE SERVICE to INDUSTRY

For 75 years Johns-Manville has pioneered in the research and development of products designed to eliminate industrial waste, reduce maintenance expense, and provide permanent, fireproof building materials for the protection of costly investments.

A number of the more important of these products are described in this catalogue. Further details—and the technical assistance of our Sales Engineers—are available to you at each of our branch offices.

Johns-Manville

Offices In All Large Cities

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OTHER JOHNS-MANVILLE PRODUCTS

The following Johns-Manville products are not listed in this catalogue.
For information concerning them, send for the publications indicated.

MATERIALS

Asbestos Textiles, Papers and Fibres	<i>Data Sheets TX-1 to 4</i>
Asbestos Wainscoting	<i>Form WT-3A</i>
Celite for Concrete, Mortars and Asphalts	<i>Forms CC-1A and CC-4A</i>
Filter-Aids and Mineral Fillers	<i>Data Sheets FI-1 to 500</i>
Home Insulation	<i>Form HI-18A</i>
Insulating Board	<i>Form IB-7A</i>
Sound Control	<i>Forms AC-9A and AC-11A</i>

PUBLICATIONS

SIXTY J-M OFFICES AT YOUR SERVICE

At each of the offices named below you will find representatives fully qualified to answer any questions about Johns-Manville products, and to assist you in problems where J-M Materials can be of service.

AKRON	CHARLOTTE	DETROIT	MEMPHIS	PITTSBURGH	SAN FRANCISCO
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BUFFALO	DAYTON	LOS ANGELES	OAKLAND	ST. LOUIS	WHEELING
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JOHNS-MANVILLE INTERNATIONAL CORPORATION

22 East 40th Street, NEW YORK, N. Y.

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Johns-Manville

EXECUTIVE OFFICES: 22 EAST 40th STREET, NEW YORK, N. Y.

JOHNS-MANVILLE SHEET, BRICK AND BLOCK INSULATION FOR HEATED SURFACES

Johns-Manville provides insulating materials for use throughout the entire range of industrial process temperatures. The more important of these products are briefly described in the following pages.

Sil-O-Cel Insulating Brick—Three types of Sil-O-Cel Insulating Brick are available: Sil-O-Cel Super Brick (calcined) for temperatures as high as 2500 deg. F., Sil-O-Cel C-22 Brick (calcined) for temperatures to 2000 deg. F., and Sil-O-Cel Natural Brick for temperatures to 1600 deg. F. Sil-O-Cel Brick are ordinarily used behind fire brick in boilers, still furnaces, heat treating furnaces, kilns and other high temperature equipment. Sil-O-Cel Super Brick and Sil-O-Cel C-22 Brick are often used without fire brick protection as an inner lining in high temperature flues and in electrically heated and muffle type furnaces.

All types of Sil-O-Cel Brick are furnished in standard fire brick size, $9 \times 4\frac{1}{2} \times 2\frac{1}{2}$ in., and as No. 1 and No. 2 arch brick. Sil-O-Cel Natural Brick are also supplied in $1\frac{1}{4}$, 2 and 3-in. thicknesses. Sil-O-Cel C-22 Brick are also supplied 3 in. thick. Packed in fibre cartons of 25, $2\frac{1}{2}$ -in. brick or an equivalent volume of other sizes. Special mortar shipped for laying.

Superex Blocks—Diatomaceous silica and asbestos fibre, bonded together. Highly efficient for insulating boiler walls, furnaces, etc. Temperature limit, 1600 deg. F. Furnished in blocks 3×18 in. and 6×36 in., flat or curved, in thicknesses of 1 to 4 in. Other sizes on special order. Weight about 2 lb. per sq. ft., 1 in. thick.

Superex Combination Insulation—One or more layers of 85% Magnesia or Asbesto-Sponge Felted are often used outside of Superex, this construction being termed Superex Combination Insulation. Such combination results in greater insulating efficiency and heat resistance for a given insulation thickness. The Superex is always used next to the hot surface as a protection for the other insulation, which, though high in insulation value, is comparatively low in heat resistance. The proper combination and thickness depends on the maximum operating temperature, average operating temperature, cost of heat and degree of temperature control required.

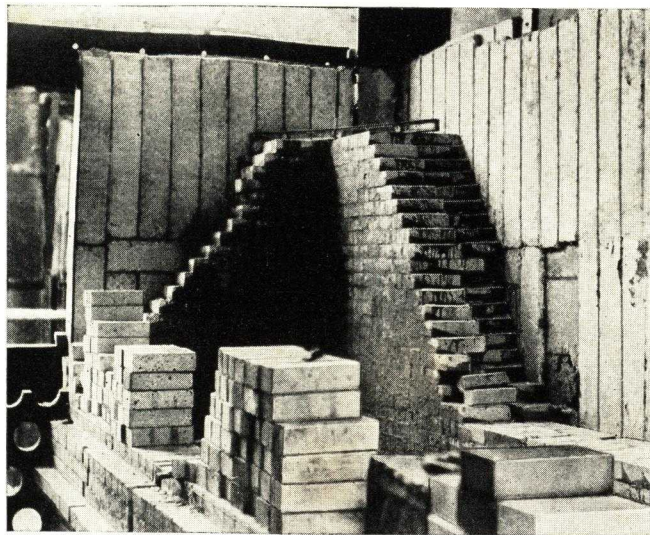
The figures in the following table for Superex Combination Insulation over metal surfaces are approximations based on usual conditions. To use the table, select the insulation combination which corresponds to the maximum temperature to which the inner surface of Superex will be subjected in service.

Where a greater thickness of insulation than that given in the table is used, the relative thickness of Superex to Magnesia or Asbesto-Sponge Felted should not be less than the proportions shown. The usual finish over the insulation is two coats of No. 302 Insulating Cement, each $\frac{1}{4}$ in. thick. If this finish is used outdoors, Insulkote either replaces the second cement coat or is applied $\frac{1}{4}$ in. thick over the $\frac{1}{2}$ in. of cement. The heat loss noted in the table assumes a finish of $\frac{1}{2}$ in. No. 302 Insulating Cement covered by $\frac{1}{4}$ -in. Insulkote.

J-M BLOCK INSULATION ON METAL SURFACES

Maximum temperature on Superex, deg. F.	Thickness of Superex, inches	Thickness of Asbesto-Sponge Felted or 85% Magnesia, inches	Total thickness of block insulation, inches	Heat transmission, B.t.u., per sq. ft., per hr., at stated temperature		Average insulation efficiency, per cent
				85% Magnesia	Asbesto-Sponge Felted	
300	...	2	2	50.7	46.4	93.42
400	...	$2\frac{1}{2}$	$2\frac{1}{2}$	60.5	56.2	95.40
500	...	3	3	68.2	64.6	96.69
600	...	$3\frac{1}{2}$	$3\frac{1}{2}$	74.6	71.6	97.53
750	$1\frac{1}{2}$	$2\frac{1}{2}$	4	89.8	87.4	98.14
900	2	2	4	114.2	111.5	98.34
1000	$2\frac{1}{2}$	2	$4\frac{1}{2}$	118.1	116.2	98.66
1200	$3\frac{1}{2}$	$1\frac{1}{2}$	5	138.0	137.2	98.92

The same principles of combination insulation apply to the insulation of furnaces as to metal surfaces, except that brickwork has appreciable resistance in itself to heat flow. This changes the necessary total thickness of insulation and also affects the thickness of Superex to be used, due to the increase of temperature on the Superex materially above the temperature of the brick exterior if uninsulated. In such work it is sometimes also necessary to restrict the thickness of Superex when



Superex Combination Insulation, $3\frac{1}{2}$ -in. Thick, Applied Between Transite Casing and Fire Brick Lining

used alone, in order not to exceed the temperature limit of the insulation.

Where the use of brick shapes is advantageous, Sil-O-Cel Natural Brick are used instead of Superex Blocks. Sil-O-Cel C-22 Brick and Sil-O-Cel Super Brick are used where more than 1600 deg. F. will be applied on the insulation.

Asbesto-Sponge Felted Sheets and Blocks—The most efficient insulation obtainable in these forms for temperatures to 700 deg. F. Built up of laminated sheets of asbestos felted with small particles of spongy, cellular material. Withstands rough usage and can be removed and replaced without injury. Furnished in sheets 24×36 in. and blocks 6×36 in., from $\frac{1}{2}$ to 4 in. thick. Weight about $2\frac{1}{2}$ lb. per sq. ft., 1 in. thick. Temperature limit, 700 deg. F., though often used as a second layer, over Superex, at much higher operating temperatures.

85% Magnesia Blocks and Lagging—One of the most efficient commercial insulations. Made of 85% carbonate of magnesia bonded with asbestos fibre. Furnished in blocks 3×18 in. or 6×36 in., flat or curved, in thicknesses of $\frac{1}{2}$ to 4 in. Weight about 1.4 lb. per sq. ft., 1 in. thick. Other sizes, including locomotive lagging, furnished on special order. Temperature limit, 600 deg. F., though often used as a second layer, over Superex, at much higher operating temperatures.

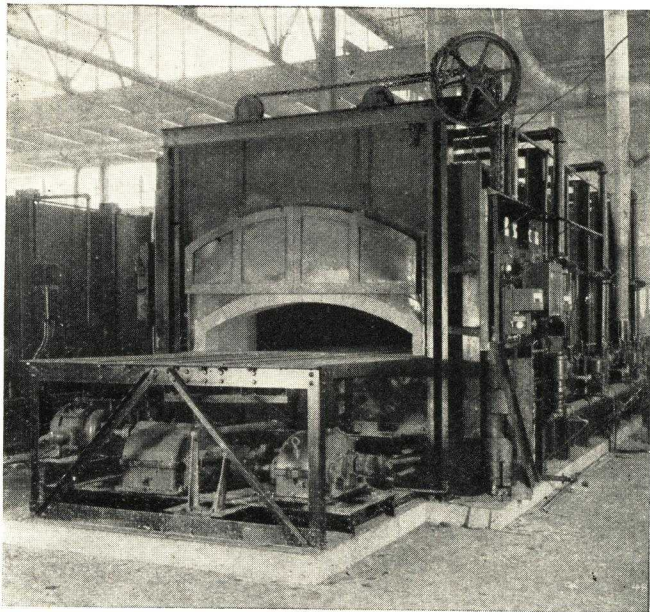
Super Fire-Felt Sheets and Blocks—A light-weight, efficient, resilient insulation made of felted asbestos fibre. Furnished in sheets 24×36 in., and blocks 6×36 in., $\frac{1}{2}$ to 4 in. thick; also in special sizes and irregular shapes to order. Weight about 1.7 lb. per sq. ft., 1 in. thick. Temperature limit 700 or 1000 deg. F., depending upon supporting construction.

Banroc Blankets—Made of Banroc (rock wool) felted between various fabrics, usually metal, such as galvanized wire netting, copper-bearing metal lath, and rib lath. Used for insulating ovens, oil refinery equipment and for similar purposes. Standard sizes of most types, 24×96 in. and 24×48 in., in thicknesses 1 to 6 in. Temperature limit, 1000 deg. F.

Asbestos Blankets—Quilted asbestos cloth filled with asbestos fibre. Used for insulating irregular surfaces where readily removable insulation is desired, such as paper digester shells and steam turbine casings. Furnished in single or double layer construction. Temperature limit, 800 deg. F.

Asbestos Roll Fire-Felt—A soft, flexible asbestos felt that may be wrapped around pipes and heated surfaces. Furnished $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ in. thick, in rolls 3 ft. wide, containing about 100 sq. ft. Weight about 1.2 lb. per sq. ft., $\frac{1}{4}$ in. thick.

Asbestos Millboard, Roll Board and Paper—Recommended where relatively thin protection against flame, heat or acid fumes is desired. Weights, thicknesses and sizes furnished on application.



Conveyor Hearth Furnace Insulated with Sil-O-Cel C-22 Brick, Superex Blocks and J-M 85% Magnesia Blocks

Industrial Insulation Applications

The fundamental purpose of insulation is to conserve heat, the loss of which from bare surfaces often amounts to several dollars per square foot per year. In many industrial applications, improvement in quality of product is attained by uniformity of temperature and the possibility of close temperature control, through use of suitable insulation. Protection of employees against excessive heat is another economically important result.

The construction of a furnace or oven, its operating temperature and continuity or discontinuity of its service, together with cost of heat, are the major factors which determine the character and thickness of insulation to be used.

Rotary Kilns—Rotary cement and lime kilns are insulated between steel shell and refractory lining with 2½ in. of Superex set up in No. 319 Semi-Refractory Cement. The insulation is omitted at the hot end for a distance equal to 25% of the kiln length, or a minimum of 45 ft. Insulation terminates flush with the upper end, except in wet process kilns where filters are not used, in which case the insulation is omitted for a distance of 20 ft. at the wet end. The refractory lining should be bonded to the steel shell longitudinally and circumferentially. With this construction, an average saving equivalent to 760 lb. of coal per sq. ft. per year has resulted, the cost of insulating materials being less than \$0.50 per sq. ft., f.o.b. factories.

Furnaces—Insulation on furnaces saves fuel, provides closer temperature control, reduces air infiltration and assures better working conditions. Added to this is the decrease of internal strains and reduction in spalling because of the smaller temperature differential between the inside and outside of the refractory. Insulation placed over the exterior of furnace brickwork promotes heat flow along the walls, and cooler portions of the furnace are raised to a higher temperature. Wall cracks, caused by uneven expansion and contraction, are fewer and smaller. Lower temperatures may be used in the heating zone yet adequate temperatures still be maintained throughout the furnace setting, which saves fuel and further prevents rapid deterioration of the refractories.

Superex Blocks, Superex-Magnesia Combination Insulation, or Sil-O-Cel Brick are usually applied between or behind the buckstays, next to the refractory lining, to a thickness sufficient to accomplish the purpose for which insulation is applied. At places of unusual thrust, such as opposite a sprung arch, or where castings and steel work are hung into the brickwork, the fire brick is carried through the insulation to the outside of the furnace. The thickness applied may vary from 2 in. on billet heating furnaces to 20 in. or more on electric oven furnaces. Furnace bases should be insulated under the refractory with a minimum of 4 in. of Sil-O-Cel C-3 Concrete.

Brickset Boilers—Insulation of brickset boilers is similar to furnace insulation. A veneer layer of Superex Insulation

or Superex-Magnesia Combination Insulation is applied over the brick to a thickness depending on the design of the boiler and, preferably, finished with flat Transite. If brick shapes are preferred, Sil-O-Cel Brick are laid up, either bonded or unbonded, to the exterior of the fire brick. In core wall construction, Sil-O-Cel Brick are built in as a core between the fire brick and an outer wall of red brick.

Water Walls—Water tube boiler walls are insulated with about 4 in. of J-M 85% Magnesia Blocks in two layers or, if the temperature is high, Superex Combination Insulation. The whole is cased with Transite panels, battened with steel strips, which makes a neat, removable and replaceable casing of remarkable durability. The heat saving of such construction amounts to more than 90% of the uninsulated loss.

Air-cooled Walls—On ventilated boiler walls, the casing over air space is best made of flat Transite, lined with 1 in. of Super Fire-Felt or Superex. A protective surface, next to the air space, is provided by J-M No. 101-S Asbestos Sheet Millboard. This panel construction between the buckstays gives superior insulation with minimum thickness. Such a casing is tight, fireproof, sectionally removable and replaceable and economical of floor space.

Regenerators—The walls of new regenerators used with high temperature furnaces are insulated with 4 in. of Superex Blocks or 4½ in. of Sil-O-Cel Brick, inside the steel casing. Roofs are insulated with 2 in. of Superex or 2½ in. of Sil-O-Cel Brick. Sections below ground are insulated with 4 in. of Sil-O-Cel C-3 Concrete. Existing regenerator walls are also insulated with 4 in. of Sil-O-Cel C-3 Concrete, and Sil-O-Cel C-3 (granular) is spread 2½ in. thick on the roof surface. It is not unusual for insulation on regenerators to repay its cost in a year's time through heat saving accomplished, not to mention improved production through minimized air infiltration.

Producer Gas Mains—Producer gas mains are insulated between refractory lining and steel shell with 2½ to 4 in. of Superex Blocks. Sil-O-Cel Brick are similarly used in 2½ or 4½ in. thickness. Such insulation reduces tar deposition, keeps the gas of higher heat value and makes fewer burnouts necessary. Superex Blocks, 2½ in. thick, save in heat over four times their cost in a year of operation, assuming 1400 deg. F. gas, and sensible heat worth \$0.25 per million B.t.u.

Flues and Breechings—High temperature flues and breechings are insulated inside with 2-in. Superex Blocks or 2½-in. Sil-O-Cel Brick, secured by metal strips or wire. Over the inside surface of the insulation, are applied two or three ¼-in. layers of No. 319 Semi-Refractory Cement, which becomes hard and resistant to abrasion, protecting the insulation from erosion by dust-laden gases. Lower temperature breechings are insulated outside with J-M 85% Magnesia or Superex. The usual finish over the insulation is No. 302 Insulating Cement, applied in two coats, each ¼ in. thick.

Stacks—Steel stacks should be lined with 2½-in. Sil-O-Cel Brick, laced to circumferential angles on 37-in. vertical centers, and finished with ½ in. of No. 319 Semi-Refractory Cement, applied in two coats, over 1-in. hexagonal mesh reinforcing. This construction prevents corrosion, increases draft, reduces fire hazard and keeps adjacent space from becoming too warm.

Hot Blast Stoves—The approved insulation for hot blast stoves consists of 2½ in. of Superex Blocks next to the shell, with 4½ in. of the fire brick lining, immediately inside the Superex, replaced by 4½ in. of Sil-O-Cel C-22 Brick. Older practice made use of Superex only, but replacing 4½ in. of fire brick with C-22 Brick has proved amply justified by the excellent return on investment. The insulation pays for itself in a few months' operation, stove capacity is increased and checkerwork lasts longer.

Hot Blast Mains—The generally recommended insulation for hot blast mains and bustle pipes is a 4½-in. course of Sil-O-Cel C-22 Brick behind a 4½-in. course of fire brick. This construction reduces radiation loss 60 or 70 per cent compared to that from an uninsulated 9-in. fire brick lining.

Annealing Furnaces—The exterior brickwork of annealing and normalizing furnaces is insulated with a minimum of 4-in. Superex Blocks or 4½-in. Sil-O-Cel Brick. For electrically heated equipment, much heavier insulation is necessary. The finish may be ½ in. of No. 302 Insulating Cement, applied in two coats, over reinforcing, but ¾-in. Transite or steel plate gives a much more durable wearing surface.

Lehrs—The thickness of glass lehr insulation is largely dependent upon the individual design, with heat saving seldom the most important item. Uniformity and control of temperature and quality of product are usually determining factors.

The economical thickness of insulation, as calculated from heat saving, may range from 3½ in., if fuel is cheap, to 18 or 20 in. in an electric lehr. Superex or Sil-O-Cel are the materials recommended. Some of the largest continuous electric lehrs use Sil-O-Cel C-22 Brick and Sil-O-Cel Super Brick for the entire lehr lining, with no refractory. This is of advantage in reducing heat storage capacity of the walls and in shortening the time necessary to bring the lehr to temperature.

Ceramic Kilns—Modern practice in ceramic kilns includes adequate insulation, not only to save fuel but also for better temperature control and greater uniformity in the finished product. Periodic kilns are insulated in the base with 3 to 4 in. of Sil-O-Cel C-3 Concrete, and in the sides with 4½ in. of Sil-O-Cel C-22 or Natural Brick (depending upon temperature), in core wall construction between the fire brick and red brick. On crowns, through which heat loss is great if uninsulated, the insulation consists of two 2½-in. layers of Sil-O-Cel C-22 or Natural Brick, or Superex Blocks, followed by a platen course of red brick and by waterproofing. Continuous tunnel kilns, with their large radiating surfaces, cannot be operated economically without thorough insulation. Sil-O-Cel Powder or Coarse Grade is generally used from 4 to 12 in. thick on sides and top. Both Sil-O-Cel C-22 Brick and Sil-O-Cel C-3 Concrete are widely used in insulating the decks of tunnel kiln cars.

Gas Making Equipment—Insulation is as necessary in the manufacture of gas as in its economical utilization as fuel. One standard design of water gas set (generator, carburetter and superheater), uses 4 in. of Sil-O-Cel C-3 Concrete under fire brick in the base, two 1½-in. layers of Superex Blocks in the sides, between the refractory and shell, and two 2-in. layers of Superex Blocks over the fire brick in the cone top. Similar construction is employed in insulating oil gas sets. Horizontal or inclined coal gas retort benches are insulated with a minimum of 4 in. of Sil-O-Cel C-3 Concrete in the base, 4½ in. of Sil-O-Cel C-22 or Natural Brick in core wall construction on the sides, and two 2½-in. layers of Sil-O-Cel Brick or Superex Blocks on the top, covered with red brick or paving brick. The walls of vertical retort benches are also insulated with 4½ in. of Sil-O-Cel Brick.

Towers and Stills—Oil towers and stills are insulated with Superex-Magnesia Combination Insulation to the thickness

indicated in the table on page 1. The finish is usually No. 302 Insulating Cement, waterproofed with Insulkote or Aertite.

Tanks—The side walls of vertical steel tanks, operating between 100 and 600 deg. F., are insulated with J-M 85% Magnesia Blocks or Banroc Blankets to the thickness shown in the following table. Roof insulation consists of Magnesia Blocks, ordinarily ½ in. less in thickness than the side wall insulation. The wall finish is Transite or Insulkote, the roof finish either black or white asbestos felt.

Temperature, deg. F.	Shell insulation, thickness
100 to 300	2 inches
300 to 400	2½ inches
400 to 500	3 inches
500 to 600	3½ inches

Industrial Ovens—Industrial ovens operate through a wide temperature range for heating, baking and drying. Heat saving, temperature control and cool workrooms are the usual factors to be considered in insulating. For example, electrically heated "V" type fender and sheet metal ovens are properly insulated with 6 in. of J-M 85% Magnesia at the vertex and 4 in. on the lower legs. Field-built body, chassis, frame and wheel ovens are similarly insulated, the thickness of insulation varying with oven temperature and fuel cost. In either case the finish over the insulation may be Transite or No. 302 Insulating Cement. Bread ovens demand adequate insulation for fuel economy, more uniform soaking heat, close temperature control and cool bakeries. Magnesia Blocks, 6 in. thick, are one of the standard insulation specifications for travelling bread ovens, with cement finish on top and Transite casing on the sides.

Pulp Digesters—Paper pulp digesters offer another example of the economy possible through insulation. In the case of twenty-two 14-ft. spherical digesters, insulated with 1½-in. J-M 85% Magnesia and waterproofed with Insulkote, the net return figures \$5,742.00 per year on an original investment of \$9,900.00 for insulation.

Send for "J-M Service to the Power Plant," Form GI-2A

JOHNS-MANVILLE PIPE INSULATION FOR HEATED LINES

Johns-Manville furnishes many kinds of insulation in a form suitable for insulating pipes conveying heated fluids. A few of these products are described below.

Asbesto-Sponge Felted Pipe Insulation—Asbesto-Sponge Felted is built up of laminated sheets of asbestos fibre felted with spongy, cellular material. It is the most efficient commercial heat insulation for pipes conveying liquids and vapors at temperatures not exceeding 700 deg. F., although it is often used as a second layer, outside a layer of Superex, at much higher operating temperatures. Its construction gives sufficient mechanical strength to withstand severe usage and vibration. Another advantage of Asbesto-Sponge Felted is the fact that it can be removed and replaced without deterioration.

For outdoor lines, particularly those of some length, the most satisfactory insulation is Asbesto-Sponge Felted with an integral waterproof jacket. The integral jacket provides complete weather protection and obviates the labor of a separate application.

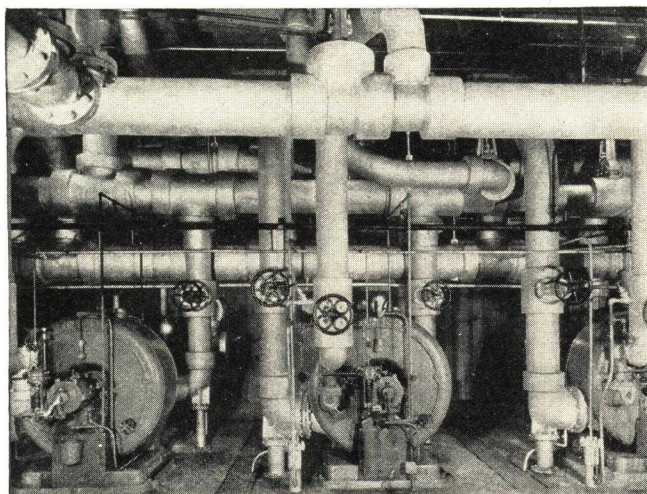
Asbesto-Sponge Felted is furnished in 3-ft. sections in thicknesses from standard (approximately 1 in.) to 3 in. to fit commercial pipe sizes.

85% Magnesia Pipe Insulation—One of the most generally used insulations. Made of highly efficient 85% carbonate of magnesia bonded with asbestos fibre. Furnished in 3-ft. sections in the following thicknesses: Standard, 1½, 2, 2½ in., Double Standard, and 3 in., to fit pipe sizes up to 10 or 12 in. For larger sizes, curved segments or lagging are supplied. Temperature limit, 600 deg. F., although Magnesia is often used as a second layer, outside a layer of Superex, at much higher operating temperatures.

Superex Pipe Insulation—In the range of temperatures so high that Asbesto-Sponge Felted or 85% Magnesia should not be used, Superex Pipe Insulation is the proper material. It is made of diatomaceous silica and asbestos fibre, bonded together. The temperature limit is 1600 deg. F. Sometimes Asbesto-Sponge Felted is used outside of Superex for mechani-

cal protection of the Superex and to increase insulating efficiency. Magnesia is also often used as an outside layer where the insulation is not subject to abrasion, because it is a little more economical in first cost and is a slightly better insulator than Superex. These combinations of Superex and Asbesto-Sponge Felted or 85% Magnesia are known as Superex Combination Insulation.

Superex is furnished in standard sections, 3 ft. long, in thicknesses from 1 to 3 in., for pipe sizes to 10 or 12 in. For larger pipe sizes it is furnished in segments.



Piping Insulated with Superex Combination Insulation and with J-M 85% Magnesia

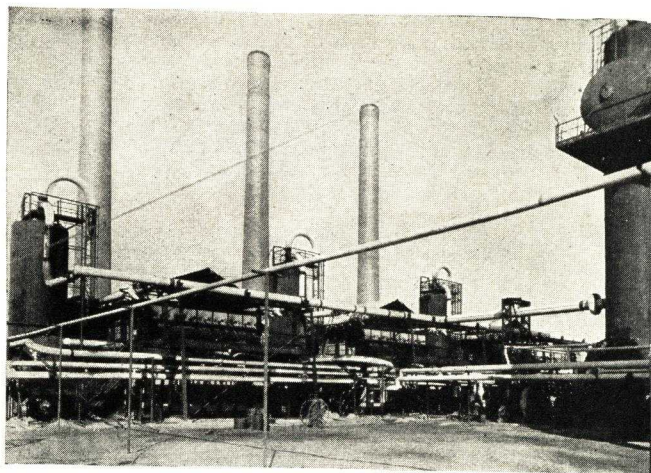
Generally speaking, Asbesto-Sponge Felted, 85% Magnesia, or Superex will solve any insulation problem on heated pipes which ordinarily arises, but other materials are available and frequently may be used to advantage. Complete information on the application of these materials is available at any Johns-Manville office.

Banroc Pipe Insulation—Made of rock wool, in two types. Style No. 25, with metal lath outside and inside, is used where a cement finish is desired. Furnished in 2-ft. sections, 1 to 4 in. thick, for pipe sizes of 2 in. and larger. Style No. 65, with a 24-gauge galvanized iron outer casing, is used where a waterproof and fireproof jacket is desired and where insulation must be frequently removed. Furnished in 2-ft. sections, 1 to 4 in. thick, for pipe sizes 2 in. and larger. Special shapes furnished for flanges and bends. Temperature limit, both types, 1000 deg. F.

Pre-shrunk Asbestocel Pipe Insulation—Made of alternate layers of plain and corrugated asbestos felts with cross-corrugations at regular intervals. It is manufactured of waterproofed felts which prevent the objectionable shrinkage encountered with other types of cellular insulation. Used on domestic steam and hot water piping. The cross-corrugations give it considerably higher efficiency than ordinary air cell insulation. Made four plies to the inch in 3-ft. sections, in thicknesses of two, three and four plies, to fit standard pipe sizes. The high-speed type is finished with aluminum or asbestos, requires no pasting and saves one-third in application labor. Regular canvas-covered finish is also available. Fine Corrugated Pre-shrunk Asbestocel is made six plies to the inch, in 3-ft. sections in four and six-ply thicknesses. Temperature limit, both styles, 300 deg. F.

Asbestocel in flexible roll form is made of a plain and a corrugated asbestos felt cemented together. Approximate thickness, $\frac{1}{4}$ in. Used, in at least 2 layers, for hot-air heater or furnace pipes. Furnished 37 in. wide, in rolls of about 250 sq. ft. Also furnished fine corrugated, $\frac{1}{8}$ in. thick, in 300-sq. ft. rolls. Temperature limit, 300 deg. F.

Wool Felt Pipe Insulation—Made of specially indented wool felt and provided with a dual-service liner for use on hot or cold water lines. Supplied in either canvas or dull-coated aluminum finish, the latter being especially designed for use where pipes are exposed to view, as in basement recreation rooms, etc. Furnished in 3-ft. sections, in thicknesses of $\frac{1}{2}$, $\frac{3}{4}$ and 1 in., double $\frac{1}{2}$ in. and double $\frac{3}{4}$ in. for all pipe sizes from $\frac{1}{2}$ to 5 in. The double layer construction permits the breaking of all through joints.



Asbesto-Sponge Felted Withstands Severe Service on Outdoor Lines

Ric-Wil Underground Conduit System

Ric-Wil Conduit offers a stable, effective, and economical means of insulating underground pipes carrying steam or hot water.

The system is complete, consisting of special vitrified tile conduit and base drain, iron pipe supports and rollers, and Dry-paC water-proofed insulation, for temperatures up to 700 deg. F.

Detailed recommendations to meet particular conditions will be furnished upon request.

Pipe Insulation Recommendations

The tables of thicknesses given below represent standardized practice in general use on heated lines. Exceptional conditions may make necessary thicker insulation. Where piping is located outdoors, it is customary to use insulation $\frac{1}{2}$ in. thicker than that used on the lines indoors.

For Temperatures to 600 deg. F.

PIPE INSULATION RECOMMENDATIONS FOR MAGNESIA OR ASBESTO-SPONGE FELTED

Thickness of insulation, J-M 85% Magnesia			Temperature, deg. F.	Thickness of insulation, Asbesto-Sponge Felted		
Pipes larger than 4 in.	Pipes 2 in. to 4 in.	Pipes smaller than 2 in.		Pipes larger than 4 in.	Pipes 2 in. to 4 in.	Pipes smaller than 2 in.
Std.	Std.	Std.	Room to 211	1 in.	1 in.	1 in.
Std.	Std.	Std.	212 to 266	1 in.	1 in.	1 in.
1½ in.	Std.	Std.	267 to 337	1½ in.	1 in.	1 in.
2 in.	1½ in.	Std.	338 to 387	2 in.	1½ in.	1 in.
Dbl. Std.	2 in.	1½ in.	388 to 499	2½ in.	2 in.	1½ in.
3 in.	Dbl. Std.	2 in.	500 to 599	3 in.	2½ in.	2 in.
			600 to 700	3½ in.	3 in.	2 in.

In general, all pipes, fittings and flanges at temperatures below 600 deg. F., except small fittings which are insulated with J-M No. 302 Cement, should be insulated with Asbesto-Sponge Felted or J-M 85% Magnesia to the thickness given in the table. Asbesto-Sponge Felted Pipe Insulation may be used, where service conditions warrant, up to 700 deg. F.

For Temperatures above 600 deg. F.

PIPE INSULATION RECOMMENDATIONS FOR SUPEREX COMBINATION INSULATION

Temperatures	600-699 deg. F.		700-799 deg. F.		800-1000 deg. F.	
Pipe size, inches	Thickness of insulation		Thickness of insulation		Thickness of insulation	
	Superex, inches	85% Magnesia, inches	Superex, inches	Asbesto-Sponge Felted, or 85% Magnesia, inches	Superex, inches	Asbesto-Sponge Felted, or 85% Magnesia, inches
1½ and smaller	2	1½	2	2	2	2
2	1½	1½	1½	2	1½	1½
2½	1½	1½	1½	2	1½	1½
3	1½	1½	1½	2	1½	1½
3½	1½	1½	1½	2	1½	1½
4	1½	1½	1½	2	1½	1½
4½	1½	2	1½	2½	1½	1½
5 and larger, approx.	1½	2	1½	2½	2	2

All pipes 1½ in. and smaller, at temperatures above 600 deg. F. (or above 700 deg. F., if Asbesto-Sponge Felted is used), should be insulated with a single layer of Superex sectional pipe insulation 2 in. thick. Small fittings are insulated with J-M No. 302 Cement. For pipe sizes larger than 1½ in., at temperatures above 600 or 700 deg. F., Superex Combination Insulation is used. This consists of a layer of Superex next to the pipe, over which is applied a layer of either Asbesto-Sponge Felted or J-M 85% Magnesia, as conditions require.

Finish of Insulation—All insulation on piping indoors should be finished with a jacket of 8-oz. canvas, sewed on over rosin-sized paper or asbestos paper, sized with glue and painted with two coats of lead and oil paint.

Where other insulation than Asbesto-Sponge Felted with integral waterproof jacket is used, the best weather protection for insulated pipe lines out-of-doors is a waterproof asbestos jacket of J-M Double-Coated Flexstone, fastened by rings of heavy copperweld wire on 4-in. centers. Double-Coated Flexstone is furnished in rolls of 108 sq. ft., 32 in. wide, weighing approximately 55 lb.

Where rough usage may be encountered a suitable metal jacket may be used instead of the weather-proof jacket.

Where exposed to fire hazard, it is good practice to apply a J-M Asbestos Firetard Jacket. In such cases the application of asphalt-saturated roofing jackets is inadvisable since flame may be carried along exposed piping when a fire occurs adjacent to lines so protected. The Firetard Jacket consists of one sheet of asphalt-saturated asbestos felt over which is cemented an unsaturated felt. It will not drip asphalt, carry flame or support combustion.

JOHNS-MANVILLE INSULATING CEMENTS, FILLERS AND FINISHES

Insulating Cements

No. 0352 Asbestocel Cement—A general utility short-fibre cement. Temperature limit, 1000 deg. F. Packed in 100-lb. bags, which cover 19 sq. ft., 1 in. thick.

No. 302 Insulating Cement—Made from asbestos fibre and binding materials. Used as a finish over insulation to provide a hard, durable and attractive surface. Temperature limit, 1000 deg. F. Packed in 100-lb. bags, which cover 25 sq. ft., 1 in. thick.

No. 304 Hot Blast Cement—Made from long fibre asbestos. Not as smooth a finishing cement as No. 302 but withstands slightly higher temperatures. Temperature limit, 1200 deg. F. Packed in 100-lb. bags, which cover 18 sq. ft., 1 in. thick.

No. 319 Semi-Refractory Cement—A combination insulating and semi-refractory cement used to protect block or brick insulation in flues, stacks, etc. Temperature limit, 1600 deg. F. Packed in 50-lb. bags, which cover 7½ sq. ft., 1 in. thick; or 15 sq. ft., 1 in. thick, per 100 lb.

No. 450 Insulating Cement—A high-grade insulating cement for applying in thicknesses equal to block insulation where the latter cannot be used. Adheres readily to hot or cold surfaces but is not a finishing cement. Temperature limit, 1200 deg. F. Packed in 50-lb. bags, which cover 20 sq. ft., 1 in. thick; or 40 sq. ft., 1 in. thick, per 100 lb.

No. 500 Insulating Cement—High heat resistance and great covering capacity make this the most adaptable material where insulation in cement form is required. Temperature limit, 1500 deg. F. Packed in 50-lb. cartons which cover 35 sq. ft., 1 in. thick; or 70 sq. ft., 1 in. thick per 100 lb.

Insulating Fillers

It is ordinarily preferable to use insulation in the form of blocks, bricks or pipe sections. In some instances, however, conditions render impracticable the use of solid insulation and then insulating fillers are adapted to serve the purpose.

Sil-O-Cel C-3—A coarse, granular calcined diatomaceous silica (Celite), used as an insulating filling on high temperature equipment. Temperature limit, 2000 deg. F. Weight loose, 28 lb. per cu. ft.; packed, 31 lb. per cu. ft. Also used in making Sil-O-Cel C-3 Concrete. Furnished in 100-lb. bags.

Sil-O-Cel Coarse Grade—Coarsely ground diatomaceous silica (Celite), used as an insulating filler. Temperature limit, 1600 deg. F. Usually packed to density of 22 lb. per cu. ft. Furnished in 110-lb. bags.

Sil-O-Cel Insulating Powder—Finely ground diatomaceous silica (Celite), used as an insulating filler. Temperature limit, 1600 deg. F. Weight loose, about 12 lb. per cu. ft.; packed, 15 to 17 lb. per cu. ft. Furnished in 100-lb. bags.

Fibro-Cel—A mixture of diatomaceous silica and long fibre asbestos. Does not settle under vibration or sift through cracks, hence well adapted for use as filling material on gas generator sets, etc. Temperature limit, 1800 deg. F. Usually packed to density of 18 lb. per cu. ft. Furnished in 80-lb. bags.

Fil-Insul—An asbestos filling material used where a resilient, non-settling insulation is desired for medium temperature applications. Because of its fibrous nature, it will not sift through cracks. Temperature limit, 1000 deg. F. Usually packed to density of 17 lb. per cu. ft. Furnished in 80-lb. bags.

Banroc Loose—Loose rock wool fibre produced from fused argillaceous limestone blown into fibres by steam. Used as an insulating filling in ovens, fireless cookers, electric and gas ranges and similar equipment. Temperature limit, 1000 deg. F. Packed in place to required density, usually 12 lb. per cu. ft. is sufficient. Usually furnished in 50-lb. bags. Can also be furnished granulated (*Banroc Granulated*) in 50-lb. bags.

Insulating Concrete

Insulating concrete has found excellent application because it may be cast into any desired form and used for lining furnace doors, insulating furnace bases and for a wide variety of other purposes where a semi-refractory insulation is required.

Sil-O-Cel C-3 Concrete—Semi-refractory insulating concrete for lining furnace doors and bases and for monolithic construction of japanning, enameling and core ovens. When suitably reinforced, large slabs may be made which are useful

as baffles, dampers, etc. Sometimes Firecrete Refractory Cement is employed as a protective facing over the C-3 Concrete.

Sil-O-Cel C-3 Insulating Concrete is made by mixing four parts, by volume, of Sil-O-Cel C-3 and one part of portland cement, with sufficient water to form a plastic, coherent mass. For this purpose approximately 28 lb. of Sil-O-Cel C-3 are required per cubic foot, when rammed into place and dried. The concrete weighs about 60 lb. per cu. ft.

This insulating concrete is over three times as effective as fire brick in preventing heat penetration. Made in accordance with specifications, the material sets up into a strong, durable concrete with a crushing strength of about 1,000 lb. per sq. in. It can be used without other refractory protection where it may be subjected to direct heat as high as 1800 deg. F.

Ovens, where the heating operation is carried on at a comparatively low temperature, are in many cases now being constructed entirely of Sil-O-Cel C-3 Concrete. Fuel consumption is surprisingly low, due to the insulating properties of Sil-O-Cel C-3 Concrete and the fact that all masonry joints are eliminated.

Sil-O-Cel C-3 Concrete is an ideal material for insulating the bases of heat-treating furnaces, kilns, oil still furnaces, hot blast stoves, open-hearth furnace regenerators and flues, and in many other types of high temperature equipment. This application is important, not only because of the fuel saving, but also because it insures more uniform heat distribution within the equipment and protects foundations from excessive heat.

Sil-O-Cel C-3 Concrete as used in the construction of furnace doors reduces costly heat waste, increases the output of the furnace, makes temperatures more uniform, improves control, and betters conditions for the operators. It weighs less than half as much as fire brick, conducts less than one-third as much heat and costs less per door installed.



Sil-O-Cel C-3 Concrete Cast into Monolithic Furnace Doors

Sil-O-Cel C-3 Concrete is excellent for making up special shapes such as baffles, dampers, etc. It is also cast into covers for wheel annealing pits; used as an insulating lining for hot metal cars in steel mills; for the construction of fire screens to protect workmen operating in front of open furnace doors; and for a great variety of other uses. In many cases Sil-O-Cel C-3 Concrete is particularly adapted for insulating the outside of walls of equipment previously constructed without insulation.

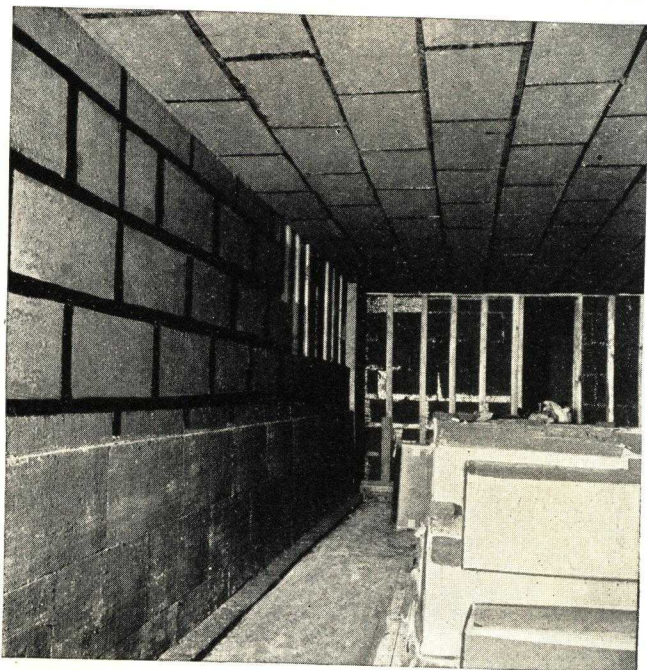
Waterproof Finishes

Certain applications demand the use of a weather-resisting, damp-proof, plastic material that can be troweled over an insulated surface as a final finish.

Insulkote—A durable, easily applied, weather-proof coating for insulated surfaces. Gray in color after aging. Can be painted with aluminum paint if desired. Temperature limit 400 deg. F. Covers 45 sq. ft., ¼ in. thick, per 100 lb. Furnished in 50, 150, 300 and 500-lb. containers. Orders placed between October 1 and May 1 are filled with "Winter Insulkote," for use when the temperature of the air is below 45 deg. F.

Aertite Coating—A tough, rubbery, asphaltic-asbestos coating in plastic form, often used like Insulkote, for weather-proofing insulation outdoors. Temperature limit, 250 deg. F. Its primary use is for coating boiler walls to prevent air infiltration. For a ¼-in. coat, 50 to 80 lb. are required per 100 sq. ft., depending upon character of surface. Furnished in 25, 50, 150, 300 and 500-lb. containers.

JOHNS-MANVILLE INSULATION FOR COLD SURFACES



J-M Rock Cork Being Applied to Cold Storage Rooms. The Rock Cork Partition Is Self-sustaining

A ton of refrigeration costs approximately 10 times as much as the equivalent number of B.t.u. produced for heating purposes. The necessity for much heavier insulation on low temperature work than is customarily used for high temperatures is, therefore, immediately apparent. Furthermore, many forms of cold storage demand that temperatures be controlled within a narrow range, a condition equally common in the cold processing of oils and chemicals. Such close control cannot be maintained without adequate insulation.

All the requisites of a satisfactory low temperature insulation are met by J-M insulations for cold surfaces, chief of which is Rock Cork, whose record of more than 20 years' successful use makes it the outstanding insulation for practically every class of low temperature work.

J-M Rock Cork—Rock Cork is a highly efficient low-temperature insulation manufactured from Banroc (loose rock wool) combined with a waterproof binder, moulded and baked. Its conductivity is 0.33 B.t.u. per sq. ft., per deg. F. difference, per hour, per 1-in. thickness.

Due to the unchanging character of the material its continued high insulating value during service is assured.

It is highly resistant to absorption and, due to the nature of the waterproof binder, furnishes an ideal base for an asphaltic adhesive medium or asphaltic cement finish, assuring an airtight waterproof seal.

Its manufacture produces a firm structure which permits it to be readily handled in any type of construction, and has

Send for Brochure on J-M Rock Cork, Form IN-9A

sufficient flexibility to follow slight irregularities of the surface to be insulated, adhering uniformly and thus eliminating voids between the insulation and the wall.

Sheets can be curved in application to fit tanks 20 ft. diam. or greater, eliminating the necessity of lags for such work.

Rock Cork is furnished in standard sheets, 18x36 in., in 1½, 1¾, 2, 2½, 3, 3½ and 4-in. thicknesses; also 18x18x1 in. Weight, about 1.25 lb. per sq. ft., 1 in. thick. Lagging, for diameters from 11 in. to 20 ft., is supplied 18 in. long, in thicknesses of 1½, 2, 3 and 4 in., and in widths 2 to 5 in., depending upon diameter.

Granulated Rock Cork, a loose, moisture-resisting filling for insulating ice freezing tanks, etc., is customarily used in twice the thickness of Rock Cork in sheet form. Packed in place to a density of about 14 lb. per cu. ft. Shipped in 50-lb. bags. Usual temperature limit of all Rock Cork products, 100 deg. F.

RECOMMENDED THICKNESSES OF ROCK CORK FOR VARIOUS TEMPERATURES AND CONDITIONS

For general purposes, the thicknesses recommended for Rock Cork Sheets or Lagging are indicated in the table below:

Temperature range, deg. F.	Thickness
-60 to -40	12 in.—Three layers
-40 to -25	10 in.—Three layers
-25 to -15	8 in.—Two layers
-15 to 0	7 in.—Two layers
0 to 15	6 in.—Two layers
15 to 25	5 in.—Two layers
25 to 40	4 in.—One or two layers
40 to 50	3 in.—Single layer
Above 50	2 in.—Single layer

Recommendations for specific installations, with construction details, will be furnished upon application at any Johns-Manville office.

Built-up Brine and Ammonia Pipe Insulation—Built-up on the job, in 2 to 6 layers of 1-in. hair felt thoroughly sealed with a waterproof membrane. Used on pipes carrying low temperature fluids, such as brine and ammonia.

Cork Insulation—A full line of natural cork insulation is carried by Johns-Manville, including corkboard sheets and lagging, granulated cork, sectional cork pipe insulation, moulded cork fittings and accessories.

Built-up Hair Felt Pipe Insulation—Built-up on the job, in layers of 1-in. hair felt spirally secured with jute twine and finished with a waterproof jacket. Used to prevent water lines from freezing, the thickness varying with conditions.

Anti-Sweat Pipe Insulation—Made of laminated insulating felt, protected inside and out with waterproofing felts. Used to insulate cold water pipes and to prevent condensation. Furnished in 3-ft. sections, in thicknesses of ½ and ¾-in. solid construction, and 1, 1½ and 2-in. broken joint construction, to fit standard pipe sizes. Waterproofing felts are also used between layers on broken joint construction.

Zero Pipe Insulation—Composed of layers of hair felt and wool felt, with a layer of asphalt-saturated wool felt inside. Used to prevent water pipes from freezing under moderate conditions. Must be weather-proofed if used on outdoor lines. Furnished in 3-ft. sections, 1¼ in. thick only, for standard pipe sizes.

JOHNS-MANVILLE PACKINGS

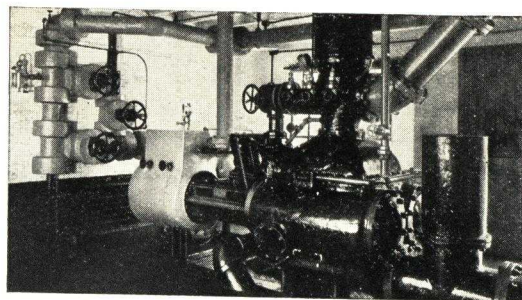
The Johns-Manville line of packings has proved its dependability and economy for all types of industrial service.

Sea Rings, an automatic packing for reciprocating rods, have surprisingly long life under severe service against any fluid, from mercury vapor to molasses.

Kearsarge Rod packing for steam, Mogul for valve stems, J-M Flax for hydraulics, Semi-Metallic for centrifugals, Service Sheet for general requirements, Kearsarge Gaskets for boilers, are a few of the well-known standard materials.

Rod, plunger, valve stem, piston, sheet packing and gaskets for any service—every requirement is met by some J-M product specially designed to serve the purpose.

All these packings are described in the J-M packing booklet, Form PK-2A, which will be promptly sent on request, by any Johns-Manville office.



J-M Packings Used in Pump, Valves and Flanges

JOHNS-MANVILLE REFRACTORY CEMENTS

J-M Refractory Cements are used for setting or bonding fire brick, as protective coatings, for patching settings, as monolithic linings, and for making refractory shapes. They resist temperature, disintegration and spalling; do not break the bond by shrinking or swelling or by reaction with furnace ash, slags or gases.

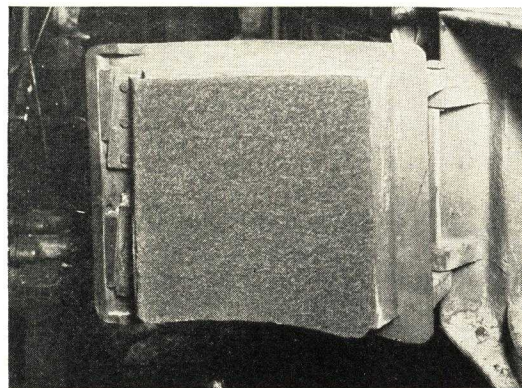
Exposure of the edges of brick to the action of flame and molten ash is the commonest cause of rapid deterioration of a setting. J-M Refractory Cement protects the edges of the brick; heat losses are cut down because open joints between the brick are eliminated; the tight construction protects the insulation from furnace gases and vapors; and air, which might otherwise be drawn in through the walls, is excluded.

Brickwork well-protected with J-M Refractory Cement will stand higher temperatures because the softening heat does not have access to the fire brick except at one face. Spalling, too, is decreased by this construction, because there is a more uniform temperature gradient through the brick. Clinker deposits are retarded by eliminating open joints and by making surfaces as smooth as possible with wash-coating.

The erosive action of oil flame and the slagging of brick by low-fusion ash are mitigated in a setting with tightly sealed joints and brick pores filled by wash-coating. This also tends to prevent brick disintegration by the action of furnace gases. A correctly applied patch will greatly retard further deterioration of refractories which are spalling or melting away from any of these causes.

If the brickwork has failed locally, instead of replacing the destroyed brick, it is frequently economical to take out the old brick and pound in J-M Plastic Fire Brick Material. Pit fires, metal ladles, induction furnaces and domestic oil burning

furnaces may be effectively lined with the proper J-M Refractory Cement, rammed or poured in to form a monolithic refractory interior.



Inspection Door Lined with Firecrete

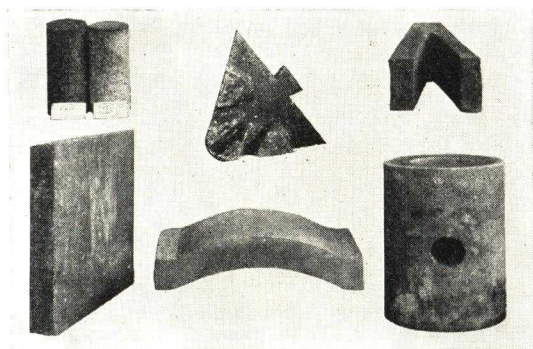
J-M Refractory Cement Recommendations

A good refractory cement should have approximately the same base as the refractory used, and a temperature resistance equal to or better than the brick. The bonding strength and other properties should be such that the cement will not separate from the fire brick due to movement in the setting and the refractory cement should be chemically inert to the action of the furnace.

The great variety of industrial furnace conditions precludes the possibility of using one type of refractory cement to meet all requirements. From a complete line, developed to serve specialized purposes, Johns-Manville recommends the following cements for general work:

For a brick-to-brick, or dipped, joint and for wash-coating, J-M No. 32 Refractory Cement (dry) or J-M No. 20 Plastic Refractory Cement (thinned). For a bond joint ($\frac{1}{8}$ to $\frac{3}{8}$ in.), J-M No. 31 Refractory Cement (dry) or J-M No. 20 Plastic Refractory Cement. For hot patching, J-M No. 29 Plastic Refractory Cement. For light patching, J-M No. 33 Super-Refractory Cement. For heavy patching, J-M Plastic Fire Brick Material. For making monolithic linings and refractory shapes, J-M Firecrete.

A brochure will be mailed on request, which gives complete information on refractory cements and their uses in various industries.



Some of the Shapes Easily Cast with Firecrete

Send for Brochures: "J-M Refractory Cements," Form RC-4A; and "Refractory Cements for Oil Burners," Form RC-3A

DATA ON JOHNS-MANVILLE REFRACTORY CEMENTS

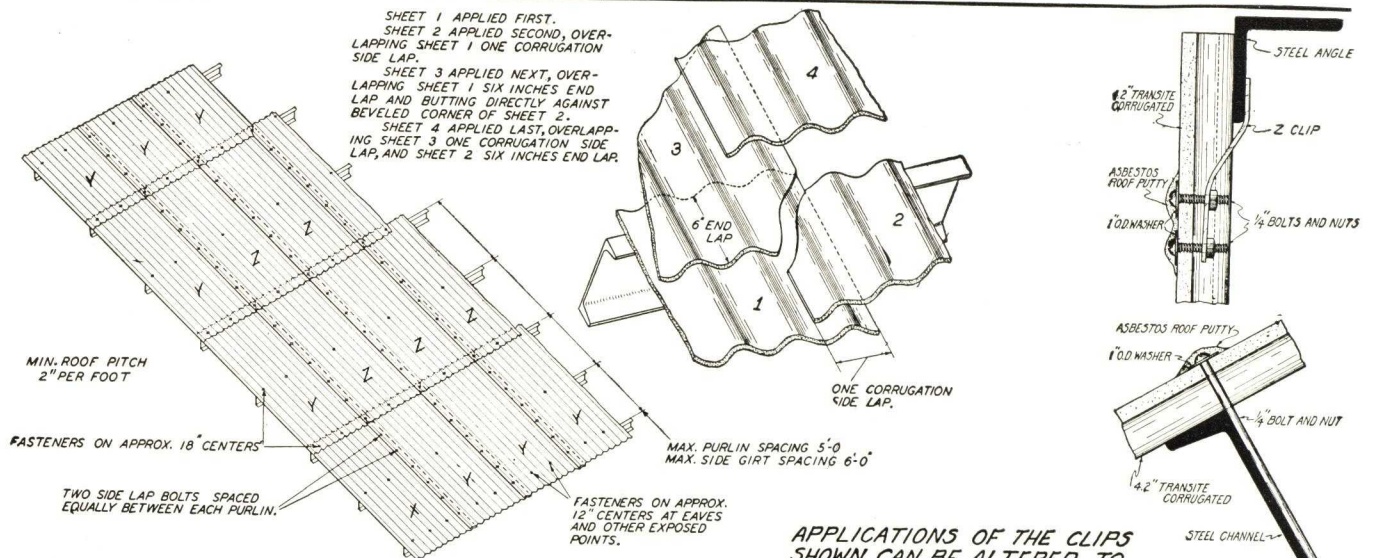
Character or base	No. 20	No. 26	No. 29	No. 30	No. 31	No. 32	No. 33	No. 34	No. 35	Firecrete	P. F. B. M.
	Silica	Aluminum silicate	Aluminum silicate	Silicon carbide	Aluminum silicate	Aluminum silicate	Processed Kaolin	Chrome	Processed high alumina	Aluminum silicate	Aluminum silicate
Highest working temperature deg. F.	2750	2900	2900	3000	3100	3100	3300	3400	3500	2600	3100
Lowest working temperature deg. F.	Air setting	Partial air setting	Air setting	1450	1450	1250	1250	Partial air setting	1200	Hydraulic setting	1500
Pounds required for setting 1000 brick with $\frac{1}{8}$ - $\frac{3}{8}$ -in. bond or cushion joint	.....	600-700	*	800	600-700	*	750†	**	750	**	†
Pounds required for setting 1000 brick with brick to brick or rubbed joint	400	.....	400*	.....	.....	400*	†	600**	.....	**	†
Form in which furnished	Ready-mixed	Dry	Ready-mixed	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Ready-mixed
Size containers	5, 10, 25, 50, 100, 250, 500, 850 lb. cans or drums	100 lb. bags	100, 240, 485, 800 lb. drums	100 lb. bags	100 lb. bags	100 lb. bags	100 lb. bags	100 lb. bags	100 lb. bags	100 lb. bags	100, 250 and 500 lb. drums

†For Wash Coating—Approximately 35 lb. of No. 29 mixed with 7 lb. of water per 100 sq. ft. Approximately 50 lb. of No. 32 mixed with 30 lb. of water per 100 sq. ft. Mix thoroughly and apply with a brush.

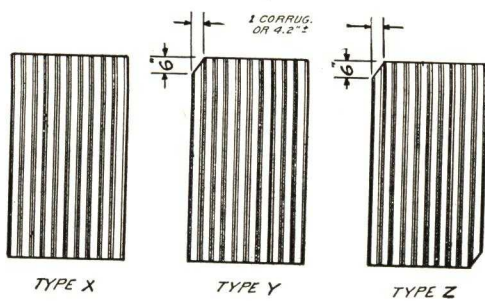
**For Monolithic Work—110 lb. of dry Firecrete required for 1 cu. ft. of construction. About 200 lb. of No. 34 required for 1 cu. ft. of construction.

†For Patching—Approximately 125 lb. of P.F.B.M. required per cu. ft. About 130 lb. of No. 33 per cu. ft.

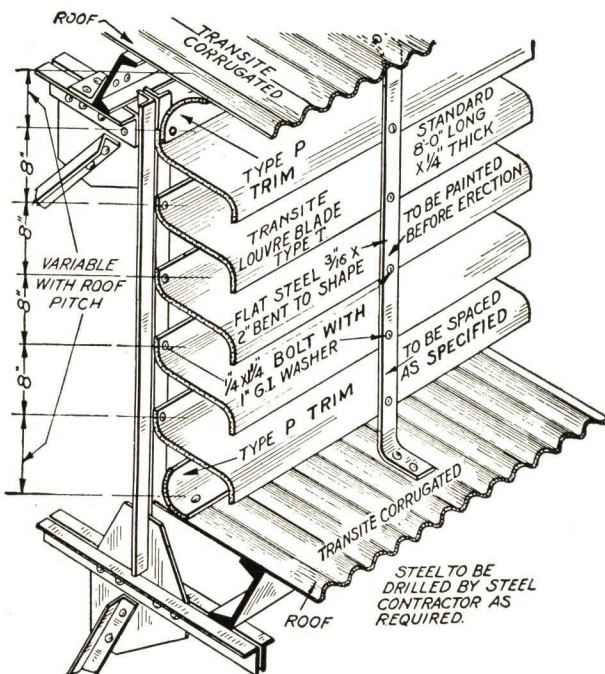
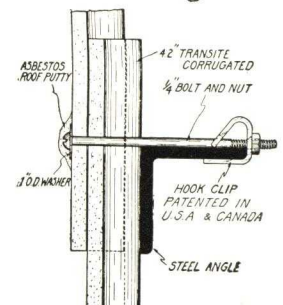
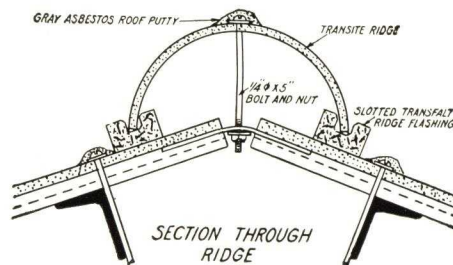
‡Plastic Fire Brick Material, abbreviated P.F.B.M., should be used in a very stiff condition.



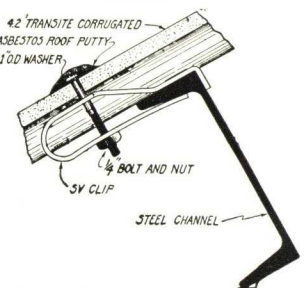
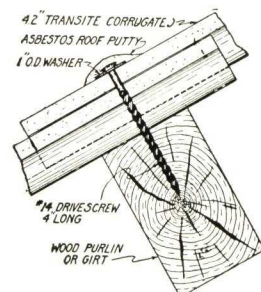
STRAIGHT LAP LINE CONSTRUCTION WITH CUT-CORNER SHEETS



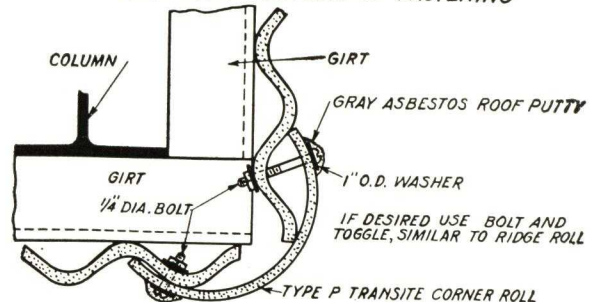
TYPES OF CUT-CORNER SHEETS



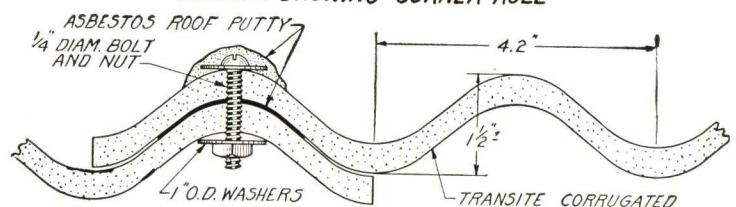
TRANSITE LOUVRE CONSTRUCTION
IS IDEALLY ADAPTED FOR MONITORS
AND OTHER LOCATIONS WHERE ABUNDANT
VENTILATION MUST BE COMBINED WITH
MODERATE WEATHER PROTECTION



STANDARD METHODS OF FASTENING



SECTION SHOWING CORNER ROLL



SIDE LAP CONSTRUCTION

CONSTRUCTION DETAILS FOR J-M CORRUGATED TRANSITE

JOHNS-MANVILLE CORRUGATED AND FLAT TRANSITE

J-M Transite products are composed of asbestos fibre and portland cement, combined under tremendous pressure into a homogeneous, dense mass of great strength and durability. Transite is light gray in color, weighs about 124 lb. per cu. ft., can be drilled with twist drills, punched, fastened with nails or screws and sawed with a hand saw, though a portable power saw should be used if much sawing is to be done. Transite will not burn, rot, corrode, shrink or otherwise deteriorate, and requires no painting or maintenance of any kind. It is made in different forms for various purposes.

Corrugated Transite Sheets

Corrugated Transite sheets are particularly designed for use as roofing and siding. Accurate cost records indicate that the use of this material assures longest building life and lowest per annum cost. The widespread utility of Transite in industrial plants is due to its high resistance to acid fumes, alkaline vapors and adverse atmospheric conditions as well as its strength, permanence, fireproof quality and ease of application.

In oil refineries it is used for fireproof aprons and roofs over stills, for housings of various types, and for "flare-back" walls around tanks to prevent spread of burning oil to adjacent tanks.

For railroads, it is an excellent material for switch towers, freight houses, way stations, and relay, battery and tool sheds. Also used successfully for pedestrian overpasses and smoke baffles, and particularly suited for roundhouses and car shops.

In the chemical and metallurgical industries, Transite solves difficult building problems, because of its comparative permanence where ordinary building materials are quickly destroyed. In gas and coke plants, electro-chemical industries, smelters, refineries, etc., Transite affords ideal construction because of its resistance to heat, steam and chemical fumes.

In mining and quarrying, Corrugated Transite is used as roofing and siding for hoist houses, loader and crusher sheds, storehouses and similar structures.

In many public utility and industrial plants where large quantities of coal are handled, Transite is the preferred material for coal conveyor housings.

Warehouses and docks, subjected to fire risks not only from the type of materials stored, but also the proximity of locomotives and ships, use thousands of square feet of Transite.

Garages and airplane hangars call for a fireproof, light-reflecting material which is easily erected on standard steel building frames and is neat and businesslike in appearance. The pleasing appearance and low cost of Transite waiting-rooms, terminals and hangars make it highly desirable for this purpose.

Because it is easily erected with minimum labor expense, requires no painting for preservation or appearance, and will outlive any other material used on open-frame construction, Transite roofing and siding is an asset for exposition or fair buildings which are used only intermittently.

Corrugated Transite sheets have corrugations with a 4.2-in. pitch and a depth of 1½ in., and are furnished 42 in. wide in lengths of 3, 3½, 3¾, 4, 4¼, 4½, 4¾, 5, 5¼, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½ and 11 feet. The thickness is approximately ⅞ in. at ridge and valley of corrugations, and approximately ⅝ in. on tangent. Weight approximately 4.1 lb. per sq. ft. uncrated, or 4.75 lb. per sq. ft. crated. Curved or special cut sheets can be furnished on special order.

Send for Brochure, Form TR-2A

JOHNS-MANVILLE TRANSITE PIPE

Transite Pipe, an asbestos and portland cement product, is built up under pressure to a uniform wall of dense, homogeneous structure with high strength and unusual ability to withstand destructive agencies.

Transite Pipe is manufactured by Johns-Manville under the process patents owned by Societa Anonima "Eternit" Pietra Artificiale, Genoa, Italy. This pipe has been manufactured and sold in Italy under the trade name "Eternit" for the past eighteen years.

CLASSES OF TRANSITE PIPE

Class	Working pressure lbs. per sq. in.	Equivalent head, ft. of water
F	0	0
S	0 to 21	50
A	43	100
B	86	200
C	130	300
D	173	400
E	217	500

Because of its unusual strength, Corrugated Transite can be laid on purlins spaced 60 in. and on girts spaced 72 in.

Corrugated Transite is also furnished in the form of ridge and corner rolls, and louvres. Details of construction, including design of corrosion-resisting fasteners, may be had on application to any Johns-Manville office.

The cut-corner construction is an important feature of Corrugated Transite sheets, which permits them to be laid with side laps in vertical lines. Type X sheet has all corners square; Type Y has one corner cut; and Type Z has two diagonal corners cut. The inside and outside radii of the corrugations are the same, insuring nesting at laps. Sheets can also be furnished with all corners square, for staggered joint construction.

Flat Transite Sheets

Transite in flat sheets is used as a casing over insulation on industrial furnaces and boilers; for ceilings, walls, panel work, partitions and fire doors in building construction; for arc barriers in electrical work where high dielectric strength is not required; and as dryer housings, hoods, dampers, baffles, and ducts in various industrial processes. It is also furnished made up into core plates, ducts, forge jacks, smoke jacks, etc.

Flat sheets are furnished 36x48 in. and 42x48 in., in thicknesses of ⅜ to 4 in., and 42x96 in., in thicknesses of ⅜ to 2 in. The special core plate material is furnished ¼, ⅝, ¾ and 1½ in. thick in sheets 36x48 in., or in rectangular cut pieces.

W. R. Transite

Both Flat and Corrugated Transite sheets can be furnished with a bituminous impregnation to afford maximum impermeability where the material will be subjected to extreme or sustained moisture or acid conditions.

W. R. Flat Transite is furnished in standard size sheets, 42x96 in., ¼ in. thick; 42x48 in., ⅛, ⅜ and ¾ in. thick; and 36x48 in., ⅛ and ⅜ in. thick. Smaller sizes can be furnished on special order.

W. R. Corrugated Transite is furnished in the same size and thickness as the standard Corrugated Transite, up to and including lengths of 8½ ft.

Other Transite Products

Encased Insulating Board—Made up of ½ or 1-in. J-M Insulating Board, 42x96 in., with a ⅛-in. sheet of flat Transite cemented to each side. Used as a combination insulation and casing on dryers and ovens.

Transite Ventilators—Made from Transite Pipe which is described below. These ventilators are designed to give best possible air circulation on all buildings where fire-proof, fume-proof and weather-proof construction is desired. Sizes, 10 to 24 in. are shipped completely assembled. Larger sizes are shipped knocked down.

Transite Leaders and Gutters—Another development from Transite Pipe. Resistance to freezing and thawing and sudden temperature changes, fireproofness, and high resistance to corrosion are the features of these products. Connections and fittings are furnished as required. Circular leaders are supplied 2 to 6 in. in diameter. Semi-circular gutters are made in widths from 4 to 10 in.

Physical Properties

Transite Pipe is considerably lighter than other common water pipe of a corresponding size, even though the wall thickness of Transite Pipe is somewhat greater. It is highly resistant to external and internal corrosion, tuberculation, electrolysis and the reaction of many chemicals.

Tests have indicated that, because of its unusually smooth interior surface, Transite Pipe has 13% higher delivery capacity than most other forms of water pipe of the same diameter and under the same conditions of head and installation. Moreover, this smooth interior surface is maintained throughout the life of the pipe and is not reduced by tuberculation or corrosion.

Transite Pipe is non-combustible and, when used as a stack or vent to carry off the products of combustion, will fulfill the requirements without disintegrating, cracking or buckling. Its normal temperature limit is 700 deg. F.

Because of its low heat conductivity, Transite Pipe retards drop in flue gas temperature, which decreases condensation and improves draft.



14-in. Class C Transite Pressure Pipe Used as Water Main. Note Simplex Couplings

Uses of Transite Pipe

The following are typical applications of Transite Pipe, indicating the more common fields of usefulness:

Class F Pipe (Round or Oval)

Vents for domestic gas-burning appliances.
Flues and flue linings.
Vents for industrial furnaces.

Class S Pipe

Soil piping and sewer connections.
Fire protection for electric cables.
Low pressure water and process liquor lines.
Irrigation and drainage.
Stacks and vents for corrosive vapors.
Laboratory vent systems.
Hot air heating ducts.

Classes A, B, C, D, E (Pressure Pipe)

Water supply and distribution mains.
Sewer ejection lines.
Mine drainage and sluices.
Brine lines.
Process liquor lines.
Pure water lines for chemical plants.
Drainage and culverts.
Irrigation lines.
Large stacks.

Transite Pipe, fittings and accessories are available in sizes commonly required for the service intended.

JOHNS-MANVILLE ROOFING, SHINGLES AND ROOF INSULATION

To meet any roofing requirement, Johns-Manville supplies bonded built-up roofs, asbestos and asphalt shingles, ready-to-lay roofing, insulated and rot-proof roofs, roof insulation, and all necessary accessory materials. Corrugated Transite for roofing and siding is described on the preceding page.

For the past three years, much industrial equipment has been idle. To a marked degree, the wheels of industry have stopped turning. But machinery and internal plant equipment, when properly cared for, suffer practically no depreciation while in disuse.

Building exteriors, particularly roofs, are in a different category. They are constantly exposed to the weather and deteriorating influences are at work irrespective of the state of production.

It is here that immediate attention is demanded if a disproportionate future expense is to be avoided. A small expenditure now to make needful repairs to the roof will often save five to ten times the cost a few years hence. The additional advantage is that storm and weather are kept away from the building contents in the interim.

J-M Roof Survey Plan

For some time Johns-Manville has been organizing inspections and surveys to gather data on the effects of weather and water on roofs of different makes and lengths of service. The details of each inspection are incorporated in a report which is filed in the J-M District Office.

In many instances, these reports contain records of small defects which, unless promptly taken care of, are likely to become worse and cause serious damage. If these matters are remedied right away, this can be done for much less money than if the trouble is permitted to spread.

Copies of roof survey reports, where requested, are given to interested parties, and the services of the Johns-Manville roofing organization are made available to effect repairs. Many large concerns have been so impressed by the advantages to them of the J-M Roof Survey that they have asked for inspections and recommendations on all their roofs on buildings throughout the country.

While repair work and necessary maintenance constitute the usual roofing problems at the present time, new roofs and new

constructions as developed by Johns-Manville are discussed in the following paragraphs. These materials and methods form the basis of scientific roof building and repair.

J-M Bonded Built-up Roofs

Realizing that no one type of built-up roof can satisfy all conditions, Johns-Manville has developed a number of styles of built-up roofs, each of which is designed to meet certain definite requirements.

J-M Bonded Built-up Roofs are constructed of successive layers of saturated roofing felts, alternated with layers of roofing asphalt or pitch. The kind of felt used, either asbestos or rag, and the number of layers, vary with the different types of roofs. The final surfacing also varies, being either a smooth-surfaced coating, slag or gravel, or felt with a colored crushed slate surface.

Protected by National Surety Co. Bond—To the security indicated by its own reputation, Johns-Manville adds a bond of the largest surety company in the United States, insuring fulfillment of its promise of trouble-free roofs to purchasers. Where J-M specifications are followed as to flashings, a flashing endorsement is part of the bond.

Guarantee bonds on J-M Built-up Roofs cover periods of 10, 15 or 20 years, depending upon the kind, weight and number of plies of felt, the type and pitch of roof deck and character of service.

J-M Smooth-surfaced Asbestos Built-up Roofs—The outcome of several decades of study and experience in producing durable, fireproof, weather-proof, light-weight roofs at a moderate cost. These roofs are approved by the National Board of Fire Underwriters and carry base rates of insurance. They are suitable for practically every type of industrial building, warehouse, office building, hotel, hospital and apartment house.

J-M Super Class A Roofs consist of a 60-lb. asbestos base felt and three plies of 20-lb. asphalt-saturated asbestos finishing felt, surfaced with an asphaltic coating. Over wood decks, this roof carries a 20-year bond.

J-M Class A Roofs differ from the Super Class A Roofs in that only two plies of finishing felt are used. Class A Roofs over non-combustible decks are bonded for 20 years; over wood decks, for 15 years.

Class A Roofs, with the introduction of a strong waterproofing fabric between the base and finishing felts, are ideally suited to the severe service encountered on spray decks. These special spray deck roofs are bonded for 10 years.

All-asbestos roofs over rigid insulation call for three or four shingled plies of 20-lb. asbestos felt, bonded for 15 and 20 years, respectively.

Gravel or Slag-surfaced Asbestos Built-up Roofs—Plies of 15-lb. tar-saturated asbestos felts with moppings of coal tar pitch. These roofs are bonded for 10, 15 or 20 years, depending upon type and slope of roof deck and number of plies of felt.

Combination Asbestos Felt and Rag Felt Built-up Roofs—Composed of an asphalt-saturated rag base felt followed by two plies of 20-lb. asphalt-saturated asbestos finishing felts and a smooth asphaltic roof coating. These roofs are bonded for 15 or 10 years, depending upon whether a 45-lb. or a 30-lb. rag base felt is used.

Rag or Tar Felt Built-up Roofs—Alternating layers of 15-lb. asphalt-saturated rag felts and roofing asphalt or pitch with various surfaces. The top surface of such roofs consists of gravel (maximum pitch 2 in. per ft.), or slag (maximum pitch 4 in.), or of a layer of J-M Split Sheet Slatekote (maximum pitch 9 in.). Slatekote is a heavy asphalt-saturated rag felt into which a coating of crushed slate is securely embedded at the factory. An ornamental surface can be obtained by the use of Slatekote which may be had in red, green or blue-black as standard colors and in white or chrome orange for airport construction. Bonds on these rag felt roofs are for 10, 15 or 20 years.

Applied by Approved Roofers—Proper application is just as important in producing a J-M Built-up Roof as are the materials themselves. Regardless of careful selection and manufacture, all roofing materials must be laid in accordance with specifications based on seasoned experience.

For this reason, in every community J-M Approved Roofers have been selected by Johns-Manville as qualifying in roofing experience and business integrity to carry the J-M franchise in applying built-up roofs. A J-M roof expert inspects every bonded job and passes on the workmanship and attention to detail. After roofs are in place, these experts are available for return inspections to remedy any unforeseen trouble before it reaches a serious stage—practical life extension for the roof.

J-M Roof Insulation

J-M Rigid Roofinsul is a strong insulating board made of felted wood fibres. It has a high insulating value, is extremely resistant to moisture absorption, and is economical and easy to apply. Installed in connection with a J-M Built-up Roof, it is an ideal insulation for any type of roof deck subjected to ordinary conditions. Furnished 24x48 in. in standard thickness of 1/2 in. For greater thicknesses, two or more sheets are furnished stapled together with a 3/4-in. ship-lap on all four edges.

Where interior humidity is especially high and roof drip must be eliminated, as in a paper machine room, the special

Send for Data Sheets

JOHNS-MANVILLE FLOORING MATERIALS

For many years, J-M Industrial Flooring was the standard top-flooring for industrial work. This mastic type floor has now been partially displaced where there is no objection to a non-monolithic floor or where there is a preference for flooring which may be put down in individual units, like J-M Industrial Flooring Plank.

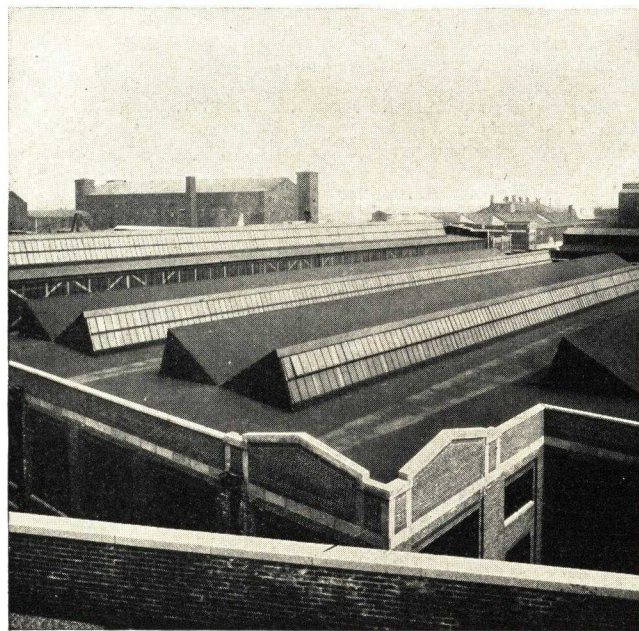
J-M Industrial Flooring Plank

J-M Industrial Flooring Plank is manufactured from selected asphalts, fibres and fillers which are compressed into rectangular planks 12x12 in. and 12x24 in., in 1/4, 3/8 and 1/2-in. thicknesses. Three colors are available—red, brown and black.

The plank is quiet, dustless, fire-retardant, vermin-proof and odorless and will not check, chip, warp or decay. It possesses considerable resilience and is capable of supporting heavy loads, but has no grain and therefore will not splinter.

Industrial Flooring Plank is rapidly and easily applied and is ready for use as soon as it is laid. Should any part of the floor be seriously injured through accident, the damaged planks are quickly replaced and the repaired section is ready for traffic immediately.

It is recommended for use on warehouse or manufacturing floors where a suitable base or sub-floor exists and where heavy static loads are not resting on small bearing areas. In



J-M Super Class A Built-up Roof on the Plant of John A. Roebling's Sons Co., Roebling, N. J.

patented roof construction known as J-M Insulated Rot-proof Roof is recommended. In this construction, cork insulation is built-up over Corrugated W. R. Transite and the whole protected by a J-M Built-up Roof.

For description of Transite as a roofing and siding material, see page 9.

Ready-to-Lay Roofing

In ready-to-lay roofings, Johns-Manville supplies both asbestos felts and rag felts, with plain or slate-embedded surfaces. They are inexpensive and well suited for uses where roll roofings are adaptable.

Asbestos and Asphalt Shingles

J-M Asbestos Shingles—Made of asbestos fibre and portland cement. Provide a weather-proof, permanent, fireproof roof, which is economical and capable of being designed to harmonize with any architectural style or color scheme.

J-M Slatekote Shingles—Made of rag felt and asphalt, with many different surface colors of crushed slate. Durable, weather-tight, inexpensive and present an attractive appearance.

such installations as shoe factories, loading platforms, transfer platforms, freight house floors and trucking aisles, Industrial Flooring Plank stands up under the extremes of light hand trucking and severe motor trucking. Aside from some stiffening effect, the plank does not impart structural strength. The sub-floor must be plane and level and support the specified load. The plank is laid in J-M Asphalt Plank Cement.

J-M Industrial Flooring (Mastic)

J-M Industrial Flooring, a durable, resilient, black asphaltic concrete, is particularly adapted to the varied needs of industry. Heavy foot or wheel traffic or shock from dropped heavy objects does not injure the smooth, waterproof, dustless surface of J-M Industrial Flooring. It is odorless, sanitary and practically wear-proof.

This tough top flooring has proved eminently satisfactory in warehouses, machine shops, freight houses, public buildings, laboratories, locker rooms, corridors, composing rooms and in miscellaneous industrial plants where strength or chemical-resisting properties are vital. It can be laid over any substantial sub-floor such as concrete, brick, tile or wood, which is, of itself, strong enough to carry the floor load.

Because it is noiseless, non-slip, vermin-proof and fire-retardant, J-M Industrial Flooring is widely used for new structures, but serves equally well laid over worn or uneven floors of wood, concrete or other material. The sub-floor is thereby preserved, and the monolithic top flooring stands up under rough usage.

Plant processes and production are not materially interrupted by laying J-M Industrial Flooring, since the floor can be used as soon as the material has cooled, a matter of a few hours. It is laid in thicknesses from $\frac{3}{4}$ in. to 3 in., depending on traffic requirements.

J-M Asphalt Tile Flooring, Type A

J-M Asphalt Tile Flooring is a decorative flooring, manufactured as a flat tile in twelve plain colors: black, red, mahogany, tan, gray, verte blue, ivy green, apple green, olive green, terra cotta, buff and rose taupe. Marbleized color combinations in attractive variety can be furnished on special order. This tile is used extensively in schools, office buildings, churches, hospitals, stores, theatres, clubs, restaurants and libraries.

J-M Asphalt Tile Flooring is odorless, waterproof and does not originate dust. It is comfortable under foot, non-slippery, and approved for use in fireproof structures.

Under the ordinary foot traffic to be found in buildings, the $\frac{3}{8}$ -in. tile is extremely durable, and improves in appearance with use. Standard tile are furnished in the following sizes: 3x3 in. and 3x6 in. in $\frac{3}{8}$ -in. thickness only; 6x6 in., 6x12 in., 9x9 in., 12x12 in. and 12x24 in. in both $\frac{3}{8}$ and $\frac{1}{2}$ -in. thicknesses.

Send for Data Sheets BMF-1 to 80; also Tile Flooring Brochures



J-M Industrial Flooring in Service Five Years at Greene Fuel Economizer Plant, Matteawan, N. Y., and Still in Excellent Condition

Standard borders are supplied of the same material, in black and in mahogany, 9x27x $\frac{1}{8}$ or $\frac{3}{8}$ in., 12x36x $\frac{3}{8}$ in. and 18x24x $\frac{1}{8}$ or $\frac{3}{8}$ in. Other colors, in these sizes, available on special order.

Borders can also be furnished 9x18 in., in thicknesses of both $\frac{1}{8}$ and $\frac{3}{8}$ in., but no stock is carried of this size.

JOHNS-MANVILLE WATERPROOFING AND DAMP-PROOFING

Johns-Manville furnishes a complete line of asphalt-impregnated waterproofing felts and fabrics, and plastic waterproofing and damp-proofing compounds.

Membrane Waterproofing—A treatment designed to render concrete and masonry structures impervious to water, more

commonly where hydrostatic pressure exists. A protective skin is built up of bituminous materials reinforced with felted or woven fabrics which completely surround or overlay the water-proofed structure. All plies are thoroughly coated with bitumen, and bonded together and to the concrete. The treatment is usually applied on the outside of the structure so that the water pressure has a tendency to keep it in place. If applied on the inside, it is usually necessary to overlay the treatment with concrete.

J-M membranes, built-up of asbestos felts and fabrics in combination, have the qualities of permanence, strength and flexibility. J-M Asbestos Waterproofing Felts have greater resistance to water than either asphalt-saturated rag felts or cotton fabrics and are preferably used as the outer reinforcing agents in waterproofing membranes. Cotton fabric is used primarily for its tensile strength and, when specified, is placed in the center of the membrane. In this position no water can reach it and it is protected from mold and bacterial action.

The bituminous material used is J-M Standard Asphalt Waterproofing Cement, carefully manufactured from selected asphaltic crude of great purity which is especially adapted to waterproofing work.

Damp-proofing—A protection against the penetration of moisture by absorption and capillary action. This method is used both above and below ground level, but its primary purpose is to prevent staining of brick, stone, concrete and interior plastering. Damp-proofing is ordinarily accomplished by bituminous surface coatings, used without reinforcing materials.

Detailed information on waterproofing and damp-proofing is available on application to Johns-Manville. J-M waterproofing and damp-proofing materials are supplied to contractors with full directions for application.



J-M Waterproofing on the Niagara River Bridge of the Michigan Central R. R.

Send for Data Sheets BMW-1 to 5; also Brochure on Preformed Expansion Joints and Asphalt Bridge Plank, Form EX-4A; and "Safeguarding Your Pipe Line Investment" (underground pipe protection), Form OI-1A

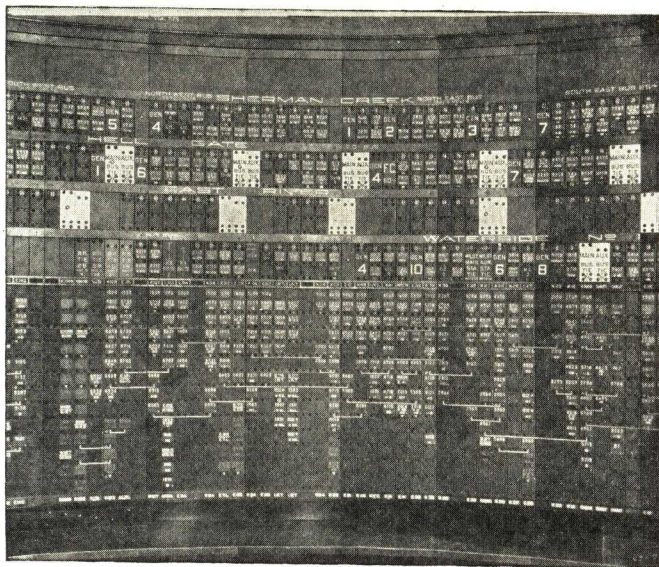
JOHNS-MANVILLE ELECTRICAL MATERIALS

In the electrical field J-M materials have met with satisfaction for more than a generation. Some of the more universally used products are briefly described below. Information in greater detail concerning them and other items in the J-M line will be promptly furnished by any Johns-Manville office.

Asbestos Ebony—A densely pressed sheet of asbestos fibre and binding cement, impregnated with an insulating compound, used for switchboards, controller plates, switch bases, etc. Has high dielectric strength, insulation resistance, mechanical strength and durability. Sheets are furnished 36x48 in. from $\frac{1}{8}$ to 4 in. thick; 42x48 in. and 42x96 in. from $\frac{1}{4}$ to 4 in. thick, or finished panels of any size within these limits.

Asbestos Ebony Moulded—Similar to Asbestos Ebony sheets but moulded in special shapes, with holes, counterbores, slots or grooves, as required. Used principally where small panels are required for switches, starters, meters, etc. Panels can be furnished in thicknesses from $\frac{1}{4}$ to $1\frac{1}{2}$ in. and in sizes to 20x25 in.

Electrobestos—A heat-resistant densely moulded material composed of asbestos fibre, high temperature clays and binding cement. Used for arc deflectors, induction furnace bushings and for heater or oven parts, heater cores, etc., where temperature does not exceed 1200 deg. F. Moulded to order in sheets 30x30 in., $\frac{1}{4}$ to 1 in. thick; panels from $\frac{1}{4}$ to $1\frac{1}{2}$ in. thick in



Asbestos Ebony Used for Systems Operating Board in the Waterside Station of the New York Edison Co.

Send for Brochure on Orangeburg Fibre Conduit, Form EL-4A

JOHNS-MANVILLE INDUSTRIAL FRICTION MATERIALS

Johns-Manville has served industry for many years with a complete line of dependable friction materials. These products have established new records for economies in power and maintenance when applied to hoists, winches, shovels, draglines, aerial tramways, inclined planes, cranes, and other equipment used in industry. Their production requires an experienced force of technicians and workmen, a thoroughly equipped laboratory for research and tremendous manufacturing facilities.

J-M Industrial Friction Materials are of both the rigid and flexible types. The rigid types, which include J-M Asbestos-Metallic Friction Blocks and J-M Moulded Friction Lining, are noted for their strength, uniformity of friction, smooth and quiet operation and long life on severe work in the low or average speed range. The flexible types wear well on light loads with high speed, have high friction and are more adaptable to all sizes of drums. Both types possess to an unusual degree the three fundamentals required of friction material in industry—heat resistance, mechanical strength and durability.

J-M Folded and Compressed Lining, Type 600 (flexible)—The best general utility lining yet to be offered to industry. It is a readily-formed, strong material that is adaptable to average speed, shock load conditions. It will resist temperatures up to 600 deg. F. very satisfactorily and the frictional value stays within reasonable limits through a wide range of temperature. The rate of wear is remarkably low, considerably below that of either woven or moulded materials.

Type 600 has a wide range of application and is unexcelled for field replacement, especially on worn drums. This lining is manufactured of asbestos cloth woven from brass wire-inserted yarns. Cloth is coated both sides with a heat-resisting compound, folded to required size, hydraulically pressed and cured by heat.

J-M Asbestos-Metallic Friction Blocks, Types 100 and 120 (rigid)—Made from asbestos, brass wire and rubber composition, hydraulically formed in a mould and cured by heat and pressure to the required shape. The difference between the types lies primarily in their friction value which is modified by changing the composition of the block, chiefly by adding graphite.

J-M Moulded Friction Lining, Types 200 and 220 (rigid)—Practically the same composition as Asbestos-Metallic Friction Blocks. However, the material is readily adaptable to wrap bands, either internal or external. The difference in type lies primarily in friction value.

The above rigid materials, because of their high mechanical strength, are particularly adaptable to low or average speed and severe shock service where there is a tendency to crush or shear the friction material due to sudden application of heavy loads. Where temperature is a factor, these materials should always be

sized to 20x25 in. Also furnished in various special forms such as cable protectors, lehr rolls and stove pipe insulators.

Friction Tapes—Cotton sheeting impregnated with an insulating compound and coated with a high grade adhesive rubber composition, used for covering wire joints. J-M brands are: Jomanco, No. 3, A.S.T.M., No. 5, J-M Friction, and J-M White Tape. Furnished in standard friction tape widths.

Niagrite-Asbestoment Cable Fireproofing—Commercially pure asbestos tape (Niagrite) with or without reinforcement, is impregnated with Asbestoment and wrapped on electrical cables to form a fireproof, arc-proof protection. Niagrite is furnished in widths of 1½, 2 and 3 in., in thicknesses of ⅜, ⅝, ⅞ and ¼ in., and in rolls of 15 ft. Special "B" Niagrite (reinforced with jute cloth) is most generally used.

Orangeburg Fibre Conduit (Made by The Fibre Conduit Co., Orangeburg, N. Y.)—Impregnated tubular ducts, made of macerated wood pulp formed on a mandrel, dried and densely impregnated with pitch. Used extensively as an underground ductway for power cables, telephone and signal lines. Furnished in 5-ft. and 8-ft. lengths. Standard diameters are from 1 to 6 in. Larger sizes on special order. Bends, elbows, crosses, tees, etc., are also supplied.

Transite—Transite, described on page 9, is used in the electrical industry for cell structures and in the construction of many types of electrical apparatus.

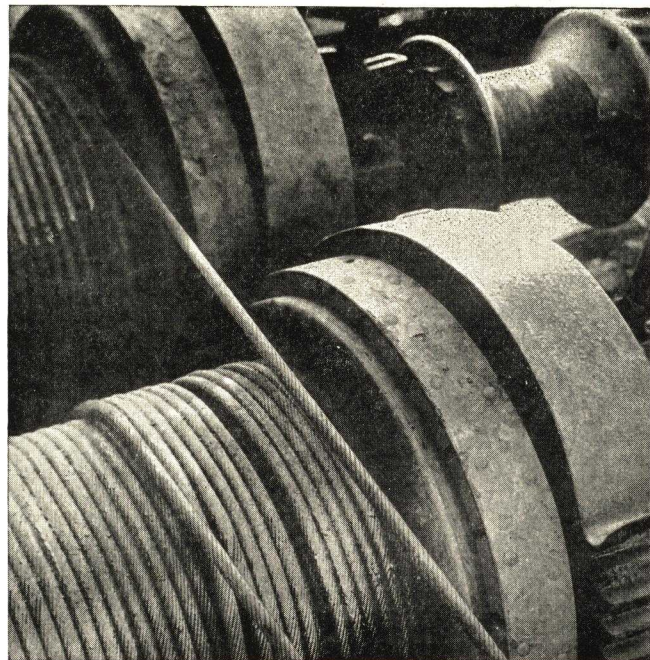
used as they are very high in heat resistance and have a remarkably constant coefficient of friction at varying temperatures.

Types 100 and 200 are most satisfactory for cast iron surfaces. Types 120 and 220 are more applicable to steel friction surfaces as they have less scoring tendency on steel. Sketches and accurate dimensions are necessary when ordering rigid materials.

Other J-M Friction Materials—Johns-Manville has a complete line of Woven Brake Linings that are designed for dry, limited-oil, or full-oil service, for low or high temperature and for light or severe loading.

Clutch facings for both cone and disc type clutches can be furnished from any of the above mentioned materials.

The Johns-Manville friction material recommendation chart, appearing in Brochure, Form FM-1A, will be sent on request. Technical assistance and engineering service on friction material problems is available through any J-M office.



J-M Friction Materials Give Long and Satisfactory Service

Complete Information Concerning J-M Products May Be Had at Any Johns-Manville Office



THE KORFUND CO., INC.

48-15 Thirty-second Place
LONG ISLAND CITY, N. Y.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Engineering Service

The confidence of many of the foremost architects and engineers in the knowledge of THE KORFUND CO., INC., has been expressed by an increasing tendency to give blanket specifications for all machinery isolation, as follows: "These machines to be isolated by the Korfund System of Machinery Isolation."

This is a wise practice, since much of the definite data required for the accurate determination of isolation methods is unavailable at the time of writing the specifications. The engineers of THE KORFUND CO., INC., are thus permitted to select adequate isolation in collaboration with the contractor, based on complete data at their disposal at the time of installation. These recommendations are then submitted for the final approval of the architect or engineer.



Literature

Copies at Your Request on Business Letterhead
Bulletin 51-B—Construction, application and uses of natural cork machinery isolation.
Bulletin 52-A—The economic advantages of printing press isolation.
Bulletin 53-A—The theory of spring suspension and the application of the Vibro-Damper.
Bulletin 54-A—Korfund products for the isolation of light machinery.
Compressed Cork vs. Korfund—The specification writer cannot ignore this important subject.
"Isolation"—A technical magazine devoted to the news and developments in the field of machinery isolation.
Engineering Reports—Detailed reports on the isolation of various types of machines.

THE NEED OF ISOLATING MACHINERY

Every machine has a tendency to vibrate on its base regardless of the most critical balance of design. Modern engineering has discovered the fallacy of rigidly bolting a machine to a massive foundation in an attempt to eliminate vibration. Every machine should be so cushioned as to allow for the natural frequency of vibration of the machine and its foundation. Wear on machinery, interference with the maintenance of critical adjustment, lowered efficiency of operatives, and an increase

in number of accidents are some of the faults which careful cushioning and adequate isolation eliminate. Isolating with natural cork or springs allows a perfectly smooth and free operation of the machine and yet prevents the transmission of vibration into the building structure or adjoining buildings. Transmitted vibration has many times been proven to be a nuisance and the basis for legal action. Landlords insist that tenants provide for the isolation of all machines.

MACHINERY ISOLATION

Korfund (Steel-bound)

A resilient mat of pure natural cork, bound in a steel frame, treated with a heavy, non-volatile oil. Unaffected by water, oil, acids and temperature changes. **Loadings:** Between 1000 and 2000 lbs. per sq. ft. for 1½-in. plates. **Application:** Korfund Plates are laid under foundation blocks, or loading may be distributed by planking or steel plate. **Sizes:** All plates made to order, standard thicknesses, 1½, 2 and 3 ins. The 3-in. plates for machines causing intense vibration. **Use:** Prime movers, printing presses, motors, pumps, elevator machines, etc.

Write for bulletin 51-B for complete information on this material.

Korfund Kompo-Kork

Plates of finely granulated compressed cork with an oxidized linseed oil binder, and a burlap backing. **Loading:** Up to 500 lbs. per sq. ft. **Application:** Kompo-Kork is particularly adaptable where irregularly shaped plates of isolation are required, or in extremely narrow widths under timber skids. It is readily cut to shape. **Size:** Up to 6x6 ft. in multiples of ½-in. thickness. **Use:** For the isolation of light machinery, for the side isolation of foundations, or for base isolation when clearance is not sufficient for 1½-in. Korfund.

Special drawings showing use and application of this material are available upon request.

Korfund Vibro-Damper

An adjustable spring device consisting of an arrangement of steel springs in a metal housing. **Loading:** There are five sizes of Vibro-Dampers ranging in loading from 50 to 10,000 lbs. per damper. **Application:** The ease of installation is a feature of the damper which makes it applicable to existing as well as new installations. **Use:** All types of machines, except those which because of their acceleration forces or high kinetic energy, require anchoring to heavy foundations. The Vibro-Damper for isolation is the closest to 100% efficiency available today.

Write for bulletin 53-A for complete information on this device.

Korfund Spring Base

Consists of an arrangement of sensitive double-acting spring chairs so designed as to resiliently suspend the floor sleepers or machine platform. **Loadings:** Maximum 250 lbs. each spring chair. **Application:** Although installation and construction of Spring Bases are very simple, the correct arrangement of the spring bases is vitally important; therefore, the services of our Engineering Department are available for designing each installation. **Size:** 8¼x1¼x1½ ins. each chair (for 2-in. or 4-in. sleepers). **Use:** Particularly adaptable for the isolation of machines where one or more units are mounted on a common base, or where the entire floor is to be isolated.

Write for bulletin 54-A for complete information on this device.

Korfund Base Isolator

A resilient mat of pure natural cork strips or blocks, top and bottom surfaces bound with asphalt and asphalt felt. Material is identical with Korfund in construction, except in the method of binding the cork strips. **Loadings:** Identical to Korfund. **Application:** Plates are applied directly to base and sides of foundation pits. By sealing joints, installation presents a watertight surface for pouring concrete. **Size:** Standard plate 24x48 ins. Plates cut to order, or may be cut with hand saw on job. **Use:** All types of machines, but especially designed for the isolation of depressed foundations.

Write for bulletin 51-B for complete information on this material.

Korfund Side Isolator

Plates consist of frame of natural cork with a granulated cork filler, top and bottom surfaces bound with asphalt and asphalt felt, combining the structural strength of natural cork with the resiliency of low density granulated cork. **Loading:** The maximum loading of 500 lbs. per sq. ft. is seldom if ever applied to side isolation. **Application:** Plates are applied with mastic or hot asphalt to sidewalls. **Size:** Standard plates 25x37 ins. by 1, 1½ and 2-in. thicknesses. Other sizes and thicknesses to order. Plates may be cut with hand saw. **Use:** For the isolation of sidewalls of foundation pits.

Write for bulletin 51-B for complete information on this material.

Korfund Seismo-Damper

A device consisting of a resilient material (cork, rubber, etc.) inserted between an upper and lower steel housing, and preloaded to exactly that point which compensates for the difference between the loading of the machine and the peak efficiency loading required by the isolating material. **Loading:** Maximum 400 lbs. each damper. **Application:** Dampers are bolted directly to the base or legs of the machine. **Size:** 5x5x1½ ins.; supporting surface 3x3 ins. **Use:** Especially designed for the isolation of all of the lighter types of machines, and machine tools.

Write for bulletin 54-A for complete information on this device.

Korfund Vibro-Plate

No single material will permanently and effectively isolate the relatively slight but complex vibrations of the light machines found in every office, shop and home. Vibro-Plate, however, has a permanently elastic core consisting of a combination of several extremely resilient materials enclosed in a sturdy metal housing. **Loading:** Up to 50 lbs. each pad. **Application:** Pads are applied directly under the legs or base of the machine. Vibro-Plate can be furnished with anchor bolts for fastening to machine if unit is inclined to shift in operation. **Size:** 4x4x1¼ ins. Special plates to order. **Use:** The isolation of business machines, oil burners, light fans and motors, etc.

Write for bulletin 54-A for complete information on this material.

KEASBEY & MATTISON COMPANY

AMBLER, PA.

DISTRICT OFFICES

BALTIMORE, MD.
BOSTON, MASS.

CHICAGO, ILL.
CLEVELAND, OHIO

DETROIT, MICH.
MILWAUKEE, WIS.
MINNEAPOLIS, MINN.

NEW YORK, N. Y.
AMBLER, PA.

PITTSBURGH, PA.
ST. LOUIS, MO.

For Ambler Asbestos Corrugated Roofing and Siding, etc., see Manufacturers' Index

Pipe Insulations

K & M "Featherweight" 85% Magnesia Pipe Insulations—This type of insulation, originated by the KEASBEY & MATTISON COMPANY, has the high insulating properties of basic carbonate of magnesia which material, combined with the proper amount of clean asbestos fibre as a binding element, produces a material absolutely fireproof, strong mechanically, exceptionally light in weight and highly efficient as an insulating material.

"Featherweight" 85% Magnesia Pipe Insulation is made in sections and segments 3-ft. long and in thicknesses as follows: *Standard*: 1½ in., 2 in., *Double Standard*: (Broken Joint) and 3 in. thickness (Broken Joint).

K & M "Hy-Temp" Pipe Insulation—Will maintain high efficiency where temperatures run from 600° to 1600° F. Hy-Temp is a combination of high heat resisting materials and asbestos fibre, which materials when bonded together produce an insulation of low thermal conductivity and relatively light weight—(about 24 lbs. per cu. ft.).

Hy-Temp Pipe Insulation is made in sections and segments, 3 ft. in length and in the same moulded shapes as "Featherweight" 85% Magnesia Insulation.

"Hy-Temp" Combination Pipe Insulation—This consists of an inner layer of Hy-Temp Insulation and an outer layer of "Featherweight" 85% Magnesia Insulation. This construction combines the great insulation efficiency of "Featherweight" 85% Magnesia with the high heat resistance of Hy-Temp Insulation.

Lamino Sponge Felt Pipe Insulation—A laminated insulation composed of asbestos fibre and particles of finely ground sponge, which materials form a cellular felt that is built up having about forty laminations per inch of thickness.

It is tough and flexible. Recommended where temperatures range up to 700° F.

Ambler Air Cell Pipe Insulation—This pipe insulation is an approved aircell insulation, made from corrugated asbestos felt, alternated with a layer of plain asbestos felt, firmly bonded together. Each layer is approximately ¼ in. thick. The absence of vegetable binders make Ambler Aircell Pipe Insulation vermin and roach proof.

Standard sizes are ½, ¾ and 1 in. in thickness, sections being 3 ft. long. Greater thicknesses can be furnished.

Woolfelt Pipe Insulation—

Duplex Pipe Insulation—A woolfelt insulation designed to give satisfactory service on either cold or hot water service lines. A special impregnated inner lining assures maximum service for these services.

Cold Water Pipe Insulation—This insulation is made of successive layers of woolfelt with an inner lining of waterproof felt. Its purpose is for use on cold water service lines.

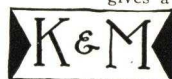
Hot Water Pipe Insulation—This insulation is made of successive layers of woolfelt with an inner lining of asbestos paper. Its use is primarily for hot water service lines.

Non-Sweat Pipe Insulation—An insulation made in single and double layer construction composed of a combination of insulating and waterproofing felt. Single layer is made in thicknesses of ½ and ¾ in. Double layer (Broken Joint) is made in thicknesses 1, 1½, and 2 in. The double layer, or Broken Joint, construction eliminates the longitudinal and the abutting joints.

Non-Sweat Pipe Insulation is a superior covering for use on cold water lines.

Non-Frost Pipe Insulation—This insulation is constructed of layers of hairfelt, surrounded by several layers of woolfelt and a layer of treated woolfelt inside the hairfelt to prevent the hair coming in contact with the pipe surface. For use on insulated cold water pipes that are exposed to moderately low temperatures.

Non-Frost Pipe Insulation is furnished in 3 ft. lengths, covered with canvas jacket, brass lacquered bands. It is made in all pipe sizes from ½ in. up, and in one thickness—about 1¼ in.



Sheet and Block Insulations

K & M "Featherweight" 85% Magnesia Block Insulation—This material is composed of carbonate of magnesia and asbestos fibre manufactured in exactly the same manner as 85% "Featherweight" Magnesia Pipe Insulation. Block Insulation is moulded and machined into proper form.

It is designed particularly for use on flat, curved and irregular surfaces of boilers, breaching, walls, stills and tanks.

K & M "Hy-Temp" Block Insulation—Hy-Temp Block Insulation is manufactured from the same combination of materials as Hy-Temp Pipe Insulation and carry the same essential qualities of heat resistance, together with mechanical strength and durability.

These blocks are furnished in standard sizes 3x18 and 6x36 in., flat and curved, in thicknesses ½ to 3 in. Special blocks can be furnished 12x36x3 in. thick, 24x36x3 in. Weight is approximately 2 lbs. per sq. ft., per 1 in. of thickness.

"Hy-Temp" Combination Block Insulation—This combination of insulation is an inner layer of Hy-Temp Blocks and an outer layer of "Featherweight" 85% Magnesia Block. The thickness of the Hy-Temp Block necessary to give maximum efficiency is determined on the basis of the maximum temperature on the inner surface of the Hy-Temp and affords protection to the "Featherweight" 85% Magnesia outer layer of insulation which is high in insulation value, but lower in heat resistance than Hy-Temp Insulation.

Lamino Sponge Felt Sheet and Block Insulation—This block insulation is recommended where surface temperatures do not exceed 700° F. It is a fabricated and not a moulded insulation. Its initial efficiency is often higher than 85% Magnesia Insulation.

Lamino Sponge Felt Block can be used in combination with Hy-Temp Block, as an outer layer which combination permits its use for much higher operating temperatures than 700° F.

Ambler Air Cell Sheets and Blocks

This type of insulation is used for medium and low temperature conditions, such as low pressure boilers, steam waterheaters, dry kilns, warm air ducts and similar services. It is an inexpensive insulation with an efficiency not quite as high as "Featherweight" 85% Magnesia Block, but it is entirely satisfactory where temperature limits do not exceed 300° F.

Standard Aircell Blocks are 6x36 and 12x36 in., from ½ to 4 in. in thickness. Each ply of block is a full ¼ in. thick. Weight approximately 1 lb. per sq. ft. per 1 in. of thickness.

Hairfelt

Navy Standard Hairfelt is made from 100% selected cattle hair. A newly developed process produces a material actually stronger and somewhat denser than ordinary steam pressed hair felt and conforms to the specifications of the U. S. Navy Department. The material is made to the full nominal thicknesses.

For insulating refrigerators, refrigerator cars, etc., K & M Navy Standard Hairfelt will give maximum service.

Plastic Insulations

Ambler Asbestos Cement—An exceptionally white asbestos cement of high insulating value having a covering capacity of approximately 27 sq. ft., 1 in. thick per 100 lbs.

85% Magnesia Cement—This cement is made of similar materials as those used in "Featherweight" 85% Magnesia Insulation. It is lighter and the efficiency is higher than other plastic insulations. Recommended for use on all surfaces having temperatures up to 600° F. Covering capacity 40 sq. ft., 1 in. thick per 60 lbs. of cement.

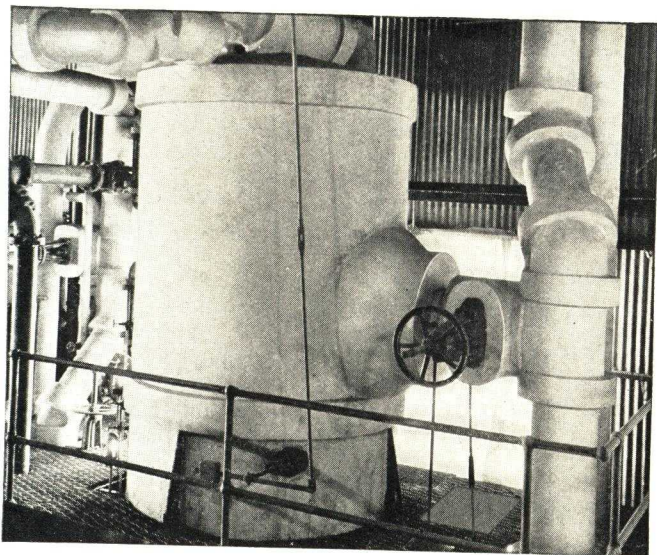
Bell Asbestos Cement—A scientific combination of selected asbestos fibres as binding materials making a cement equally effective for both roughing-in and finishing work. It has exceptionally adhesive qualities when applied to either hot or cold surfaces. Covering capacity 25 sq. ft., 1 in. thick per 100 lbs.

"E" Grade Asbestos Cement—A medium priced asbestos cement having good covering capacity and especially fine working qualities. It finishes with a smooth, hard surface, free from cracks. Covering capacity 22 sq. ft., 1 in. thick per 100 lbs.

"F" Grade Asbestos Cement—An inexpensive cement having sufficient natural bonding materials to assure its adhesiveness. Covering capacity 19 sq. ft., 1 in. thick per 100 lbs.

Velvet Hard Finish Asbestos Cement—This cement is for use as a final protective coating over insulating blocks or insulating cement. It gives a smooth, glossy hard finish which can be painted. It should be applied approximately ¼ in. thick. Covering capacity 80 sq. ft., ¼ in. thick per 100 lbs.

"Hy-Temp" Cement—This cement is similar to our Hy-Temp Insulation. It can be used for temperatures up to 1600° F. Covering capacity 30 sq. ft., 1 in. thick per 75 lbs.



K & M "Featherweight" 85% Magnesia Insulations at a Large Cement Plant

K & M Asbestos Paper and Rollboard

A combination of pure Canadian asbestos fibre beaten to a pulpy mass, free from hard gritty particles and thoroughly mixed with a small quantity of strong bonding material. These ingredients are formed into endless sheets of different thicknesses, which are properly dried out, calendered to a smooth finish and put up in rolls ready for use.

K & M Asbestos Papers and Rollboard are uniformly white in color.

K & M Asbestos Paper is made in various grades, Commercial quality, Welders quality and long fibre quality.

Ambler Asbestos Air Cell Paper

Flexible Roll Form

This improved Aircell Paper, in flexible roll form, is well adapted to insulating hot air heater surfaces, furnace pipes, ducts, etc.

It is constructed by bonding together a plain and a corrugated asbestos felt into a single sheet. Ambler Aircell Paper is full 1/4 in. thick.

This material is furnished in rolls, 36 3/4 in. wide containing 250 sq. ft. per roll, weighing about 55 lbs. per roll.

Asbestos Millboard

The base of this material is selected long fibre asbestos, from our own mines, mixed with proper bonding materials which are pre-determined by exact laboratory tests. It is white in appearance and smooth on one side.

K & M Millboard is made in various grades. They are Commercial quality, which will withstand heat up to 800° F., Welders quality which will withstand heat up to 1200° F., Gasket quality which will withstand heat up to 1000° F.

All K & M Millboard is furnished in thicknesses 1/8 in. and up, in soft, medium, hard grades.

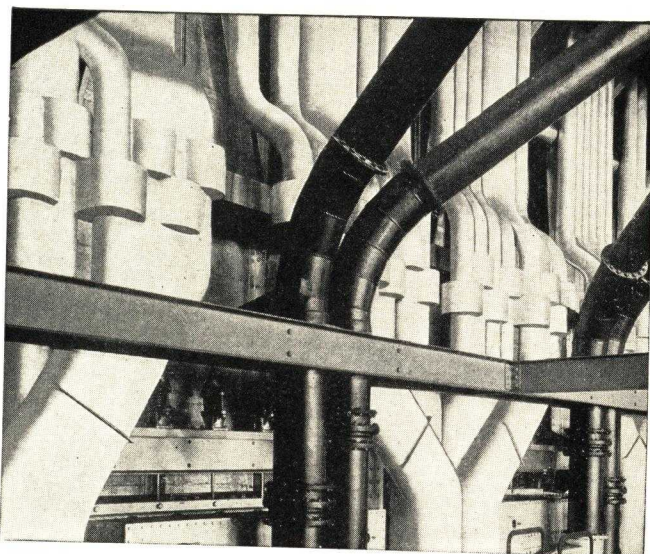
Asbestos Textiles

KEASBEY & MATTISON COMPANY manufacture a complete line of Asbestos Textile Products, ranging from roving and yarn up to the finest of electrical insulating tapes. These Asbestos Textiles are manufactured from the best quality asbestos fibre obtained from our own asbestos mines in Canada. Complete control of raw products and manufacturing processes guarantees the material and workmanship.

Keasbey & Mattison Asbestos Textiles are manufactured in four grades, these are—Commercial (approximately 80%), 90%, 95% and 98%-99%. The percentage figures designate the quantity of asbestos fibre used in the material. Cotton is the chief ingredient in Asbestos Textiles other than asbestos fibre and is used primarily to facilitate spinning and weaving.

Packings and Gaskets

KEASBEY & MATTISON COMPANY for more than forty years have been manufacturing high quality Asbestos Packings. We



Combination Hy-Temp and "Featherweight" 85% Magnesia on Water Wall Circulating Tubes at Deepwater Power Plant

have been improving the quality and design of our packings to meet the ever changing conditions and now we offer a complete line of packings designed and manufactured to meet all service conditions.

Rod and Plunger Packings—Various styles of these packings are available. Outstanding among these is "Battleship," Rod Packing, No. 45, a packing designed for service against steam, air or gas up to 500° F.

Other Rod and Plunger Packings of K & M manufacture are "Adjusto" High Pressure; Acid Resisting; Ammonia Service; "Enduro" Low Pressure steam; all grades of Flax Packings; High Temperature Packing; Hot Oil Packings and Centrifugal Pump Packing.

Piston Packings—These packings are designed for use against gasoline, crude oil, benzine, naphtha, mineral oil and hot or cold water at any temperature and pressure on inside packed pistons.

"Hydro" White Hydraulic; "Utility" Piston Packing; White Hydraulic Grade No. 2; and "Tucks" Cold Water Packing are the outstanding piston packings in the K & M line and will give maximum service for the cost.

Sheet Packing—For packing between flanges and other parallel surfaces against steam, gas, air, water, ammonia and various acid or alkaline solutions, K & M have a varied line of Sheet Packings peculiarly adapted for these services.

Outstanding among these Sheet Packings are "Amberlite" Sheet; "Battleship" Sheet; several Hydraulic Sheet Packings for various services; "Red Back" Sheet; "Red Rubber" Sheet and "Utility" Sheet Packings.

Valve Stem Packings—These packings are for use on all types and styles of small rods and valve stems and are recommended for service against super-heated and high pressure steam as well as gas, oils, acids, alkalies and greases. The principal packings of this type, are "Chief," braided and twisted; and "Service" Packing.

Gaskets and Gasket Tape—Gaskets are made in all sizes and shapes. They are constructed from the finest asbestos cloth, reinforced with brass wires, embedded in resilient rubber. They meet all the requirements for gasketing in a steam boiler plant.

Gasketing Tapes made of high quality materials with a special selvage edge are designed for use on rough or uneven surfaces, or where irregular shaped flanges require a gasket which must be cut to fit.

Engineering Service

KEASBEY & MATTISON COMPANY offer expert engineering services and assistance on difficult insulation problems. The same service is available on packing problems or where maintenance and equipment problems present unusual conditions which require asbestos treatment.

Our staff of engineers is ready at all times to study special conditions and problems and our company stands back of all recommendations made.

MUNDET CORK CORP.

450 Seventh Avenue, NEW YORK, N. Y.

DOMESTIC FACTORIES: HILLSIDE, N. J., BROOKLYN, N. Y.

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ATLANTA, GA.
BOSTON, MASS.
BUFFALO, N. Y.

CHICAGO, ILL.
CINCINNATI, OHIO
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HOUSTON, TEX.
KANSAS CITY, MO.
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NEW YORK, N. Y.
NEW ORLEANS, LA.
PHILADELPHIA, PA.

SAN FRANCISCO, CAL.
ST. LOUIS, MO.
TULSA, OKLA.

AGENTS

CLEVELAND, OHIO, C. S. Ross
DES MOINES, IOWA, John Kennedy
HARTFORD, CONN., The Hartford Cement Co.
PORTLAND, ORE., F. J. Leonard

PORTLAND, ORE., Pacific Asbestos & Supply Co.
SALT LAKE CITY, UTAH, L. A. Roser
SEATTLE, WASH., Pioneer Sand & Gravel Co.
UTICA, N. Y., George Weisenberger

Products

MUNDET "JOINTITE" CORKBOARD
MUNDET "JOINTITE" CORK PIPE COVERING
MUNDET NATURAL CORK ISOLATION MATS
MUNDET MACHINERY ISOLATION CORK
MUNDET CORK TILE
MUNDET CORK BULLETIN BOARD
All kinds and varieties of Cork Specialties.

Engineering and Specification Service

Our engineering department is at the service of architects and engineers at all times to assist and advise in the preparation of specifications pertaining to cork. This service is also available to any one who has a cold insulation or a vibration isolation problem, and is rendered without obligation. Any inquiry addressed to our nearest branch or to our home office will receive prompt and competent attention.

Our "Jointite" Cork Products Catalogue is replete with valuable information and should always be within reach of every specification writer whose field touches our products. If you do not have it, we suggest that you send for our catalogue now. This will involve no obligation.

Contract Service

We contract for the erection of our products in order that we may be certain that our material is installed in accordance with best established practice, and in order to eliminate divided responsibility for a given installation. A well organized erecting staff is maintained at each branch office. No contract involving cork is too large, too small, or too far away. All materials and workmanship are unqualifiedly guaranteed.

Warehouses are maintained by every branch and agent, in which are stocked our complete line of products. Shipments can be made at once either from these warehouses or (in the case of large quantities) from our domestic factories. The company's shipping facilities are unsurpassed, either by rail or water.

Mundet "Jointite" Corkboard

Mundet "Jointite" Corkboard is 100% pure cork, fabricated in accordance with the U. S. Government Master Specification, and is unsurpassed in its field. It is composed of granules of pure cork, from $\frac{3}{8}$ to $\frac{5}{8}$ in. in size. The granules are moulded under hydraulic pressure and baked into a solid sheet. No artificial binder is used. The natural gum in the cork is liquefied during the baking process and cements the particles into a homogeneous mass. The sheet is then trimmed and sanded to correct size.

Mundet "Jointite" Corkboard is used for all low temperature insulation services, such as cold storage plants, ice storages, fur vaults, etc. It is also used for

roof insulation in order to prevent condensation, conserve heat in the winter and keep areas under roofs cool in summer. Corkboard is highly sound absorbent



and often fulfills a dual function: Temperature insulation and acoustical correction. Mundet "Jointite" Corkboard is sold in the standard 12x36 in. sheet. Standard thicknesses are $\frac{1}{2}$, 1, $1\frac{1}{2}$, 2, 3, 4 and 6 ins.

TABLE OF THICKNESSES RECOMMENDED TO BE USED FOR COLD STORAGE WORK AS INSULATION FOR VARIOUS TEMPERATURES

Range of temperature	Walls, in.	Ceilings, in.	Floor on ground, in.	Floor above ground, in.	Roofs, in.
Below 0° F.	8	8	7	8	9
0° to 10° F.	7	7	6	7	8
10° to 20° F.	6	6	5	6	7
20° to 35° F.	5	5	4	5	6
35° to 50° F.	4	4	3	4	5
50° to 60° F.	3	3	2	3	4
Above 60° F.	2	2	0	2	2

Mundet "Jointite" Cork Pipe Covering

Mundet "Jointite" Cork Pipe Covering is the complement of Mundet "Jointite" Corkboard and is used for all types of cold lines. The method of manufacture is similar to that of corkboard, and the product is 100% pure cork. As a further protection against moisture, the inside and outside surfaces of all our cork pipe covering are finished with an asphalt coating ironed on to a smooth and even surface at the factory.

Mundet "Jointite" Cork Pipe Covering is manufactured in 36 in. lengths and in three thicknesses for line temperatures as follows: 35° to 50° F.—"Ice Water Thickness"; 5° to 35° F.—"Brine Thickness"; below 5° F.—"Special Thick."

Mundet Cork Fitting Covers—Are used in conjunction with cork pipe covering. They are available in all three thicknesses for all standard fittings.

Mundet "Jointite" Beveled Cork Lagging—Is supplied for all types of circular tanks and coolers. It is made and finished in the same manner as pipe covering, and is cut to order in such a manner as to fit exactly on cylindrical surfaces. Shipment can be made within twenty-four hours after receipt of order by our factory at Hillside, N. J.



Mundet "Jointite" Cork Pipe Covering

Vibration Isolation

The need for preventing machinery vibration from entering building structures is by now well established. The deleterious effect of vibration on buildings and equipment, worker efficiency, etc., together with the discomfort and expense due to noise resulting from vibration has been thoroughly demonstrated in the past few years. It is far more expensive to keep vibration than it is to isolate it.

Of the many materials that have been used for isolation purposes at one time or another, cork has proved itself to be pre-eminently fitted for this work. It contains over 50% air by volume, and is made up of a myriad of tiny cells, hermetically sealed from each other by the structure of the wood. Its compression curves, therefore, resemble more nearly those of a gas than of an elastic solid. This feature is important, because the resistance to loads, instead of being proportional to the amount of deflection, is proportional to the compression in the air cells. Hence, under vibratory variations in loading, the active deflection is much smaller than for an elastic substance. Furthermore, cork is resilient and not elastic. Its recoil is delayed, which blocks the possibility of synchronization.

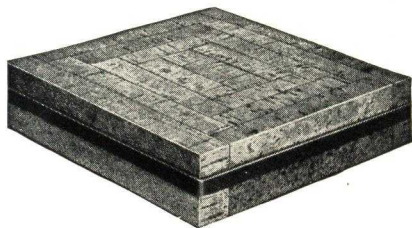
Finally, cork isolation has proven itself under the pragmatic test of use, and many thousands of installations, some of them over a quarter of a century old, are giving complete satisfaction; often making possible the use of machines which, without it, could not be used in their present locations because of the vibration accompanying their operation.

Type of Cork Isolation to Use

Mundet Cork Isolation is made in two general types. They are as follows:

(1) **Mundet Natural Cork Isolation Mat**—This form of cork isolation is suited to loads of about 600 to 2000 lbs. per sq. ft. normally encountered in machinery foundations.

This isolation is composed of blocks of natural cork of the required thickness, and is made in two types. Either the blocks are held within a rigid steel frame or they are made into a plate by affixing waterproof paper to the top and bottom of the strips with hot asphalt. The plates when laid together form a continuous mat isolation of the



Typical Mundet Natural Cork Isolation Mat
Note the natural cork strips within the steel frame

exact size necessary. In the case of average machine vibration, 1½ in. of natural cork is adequate, but for more intense vibration or shock loads, the thickness should be increased to 2 or 3 in.

(2) **Mundet Machinery Isolation Cork**—This is the material first used as isolation cork and, while it has been superseded by the above material for light and medium loads, for loads above 2000 lb. per sq. ft., Mundet Machinery Isolation Cork has not been surpassed. This cork is made in 12-in. x 36-in. sheets, of various thicknesses, and in three densities, namely: light, medium and heavy.

For loadings of 2000 to 3000 lb. per sq. ft., it is customary to use either light or medium density, ac-

cording to the character of the vibration. Light density is used for light vibrations and medium density for heavy vibrations. From 3000 to 3500 lbs. per sq. ft., either medium density or heavy density is used, according to the character of the vibratory load, and from 3500 to 6000 lbs. per sq. ft., it is customary to use heavy density. The thicknesses of machinery isolation cork used depend upon the frequency and amplitude of the vibration present, but the most common thicknesses employed are 1½, 2, 3 and 4 inches.

Machinery Isolation Cork is composed of granules, cemented together in the process of manufacture which is the same as that of corkboard. It contains more cork per cubic foot than the natural cork isolation mats. It is structurally strong, but must have a higher initial loading than natural cork isolation mat before it equals the latter in efficiency as an isolation medium. The densities in pounds per cubic foot are:

Light, 1.00-1.30; Medium, 1.30-1.50; Heavy, 1.50-1.70. A special 1.80-1.90 density is available for severe vibrations combined with exceptionally heavy loads, but this should be used sparingly.

Shipment—Mundet Natural Cork Isolation Mats can be made up and shipped within two days after the order is received by our factory at Hillside, N. J. Mundet Machinery Isolation Cork is carried in stock for immediate shipment, either from the factory or from our branch warehouses.

Mundet "Jointite" Cork Tile Flooring

Mundet "Jointite" Cork Tile is manufactured in two thicknesses, ⅝ and ½ in.

Mundet "Jointite" Cork Tile is composed of the very best selected cleaned and screened cork shavings. These shavings are placed in moulds of the proper depth to produce the tile thicknesses desired and are subjected to tremendous pressure to insure the proper density for floor use. The moulds are then placed in an oven maintained at a relatively high degree of heat. This heat liquefies the resin in the cork shavings, thus no foreign substance is needed to hold the shavings together and the natural properties of the cork shavings are not impaired in any way.

"Jointite" Cork Tile is produced in three shades, all of which are brown in color; light—medium—dark. These shades are obtained by governing the period of baking. Proper designs and arrangements of an artistic nature can be obtained by laying the tile in the different shades.

Cork Tile is used in corridors, halls, vestibules, ramps, stair treads, hospitals, schools, colleges, railroad stations, libraries, telephone rooms, offices, gymnasiums, churches, bathrooms, bedrooms, sleeping porches, nurseries, banks, theatres, courtrooms, art galleries, museums, etc. In short, when a high grade, quiet, restful and sanitary floor is desired.

Mundet "Jointite" Cork Tile Sanitary Cove Base is furnished in all heights.

Mundet "Jointite" Cork Tile is adaptable to any type nosing or stair treads.

Mundet "Jointite" Cork Bulletin Board

Mundet "Jointite" Cork Bulletin Boards are used extensively in schools, colleges, factories, offices, hotels, club rooms and, in general, wherever a soft and durable surface must be provided for the posting of notices. They are easily penetrated by thumbtacks. They are much superior to the conventional wooden bulletin board and have rendered the latter obsolete.

Mundet "Jointite" Cork Bulletin Boards are composed of a layer of composition cork ¼ in. thick which has been securely cemented to a backing of ¼ in. 3-ply, wood insert compoboard. It is a neutral brown in color and makes an ideal background in its natural state.

Mundet "Jointite" Cork Bulletin Boards are furnished cut to any size required. The standard mounted sheets measure 4x6 ft. Unmounted, the cork bulletin board can be furnished in rolls measuring 6x60 ft. Cork bulletin boards can be installed by any carpenter. They are easily cut with a saw.

Shipment can be made within twenty-four hours after orders are received by our factory at Hillside, N. J.

STANDARD ASBESTOS MFG. CO. OF CHICAGO

Manufacturers and Contractors of Pipe Coverings for Every Condition

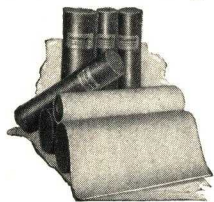
820-822 West Lake Street, CHICAGO, ILL.

FACTORIES AND PAPER MILL: CHICAGO, ILL.

Products

ASBESTOS AIR CELL BOARD and COVERINGS; ASBESTOS PAPER and ROLLBOARD; ASBESTOS SHEET MILLBOARD; WOOL FELT COVERINGS, Sweatproof and Frostproof; "STAMCO" LAMINATED ASBESTOS FELT AND SPONGE COVERING.

Also Asbestos Block Coverings; Brine Pipe Coverings; Ice Water Pipe Coverings; 85% Magnesia Coverings and Blocks; Breeching Coverings and Linings; Smokestack Linings; Asbestos and Magnesia Cements; Mineral Wool, Hair Felt, Hot Water Tank Coverings, etc.



Asbestos Paper and Rollboard

Asbestos paper is used extensively for covering hot air furnace pipes and also as a general fire-retarding material on wood partitions, etc. Furnished in 50 and 100-lb. rolls, 18 or 36 in. wide, in the following weights and thicknesses:

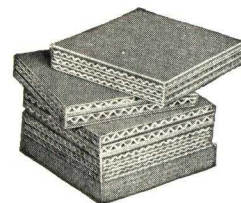
Weight per 100 sq. ft.	Approx. thickness	Approx. sq. ft. per 100 lb.
6 lb.	.0109 in.	1667
8 lb.	.0145 in.	1250
10 lb.	.0181 in.	1000
12 lb.	.0218 in.	833
14 lb.	.0254 in.	714
16 lb.	$\frac{3}{16}$ in.	625
32 lb.	$\frac{1}{8}$ in.	312
64 lb.	$\frac{1}{4}$ in.	156



Asbestos Air Cell Board

Made up of alternate layers corrugated and flat asbestos paper, firmly bound together with silicate of soda. Corrugations are 4, 6 or 8 plies to the inch; used for insulating boilers, ovens, tanks, dry kilns, etc.

Furnished in standard sheets 36x36 in., in any thickness from $\frac{1}{2}$ in. up. Special widths and lengths made to order.

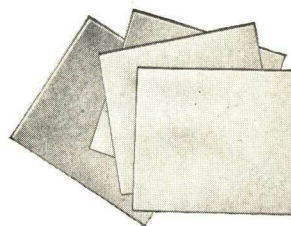


Asbestos Sheet Millboard

For general use for lining partitions, doors, etc., as a protection against fire, heat, fumes, etc.

Furnished in standard size sheets 42x48 in. (14 sq. ft.) in various thicknesses from $\frac{1}{32}$ to $\frac{1}{2}$ in.

A standard sheet $\frac{1}{4}$ -in. thick weighs approximately 18 lb.



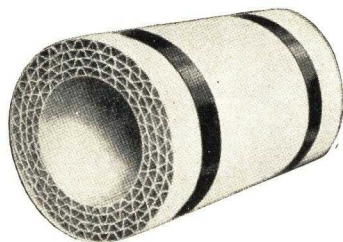
Asbestos Air Cell Coverings

These insulations are so constructed as to form very strong, medium weight coverings with high insulating qualities and make a firm, clean section, easy to apply, and give the finished job a neat appearance.

These coverings are recommended for insulating medium and low pressure steam and hot water piping, and temporary high pressure lines.

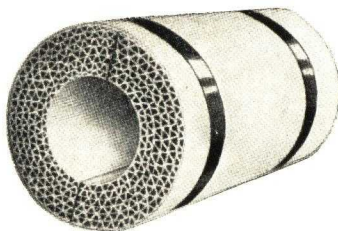
If desired, these coverings are shipped in cartons with one size to a carton, making it very easy to handle and stock. The following table gives the number of sections to each carton:

$\frac{1}{2}$ in., 30 sections	$1\frac{1}{2}$ in., 15 sections
$\frac{3}{4}$ in., 26 sections	2 in., 12 sections
1 in., 22 sections	$2\frac{1}{2}$ in., 9 sections
$1\frac{1}{4}$ in., 18 sections	3 in., 10 sections (winged)



"Standard" 4-ply

Composed of alternate layers plain and corrugated asbestos paper, firmly bound together, four corrugations to the inch



"Sixcell"

Composed of alternate layers of plain and corrugated asbestos paper, firmly bound together, six corrugations to the inch



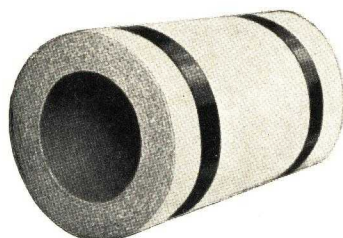
"Stanocel"

Composed of alternate layers plain and corrugated asbestos paper, firmly bound together, eight corrugations to the inch

"Standard" Wool Felt Coverings

Made up with an inner lining of tarred felt for insulating cold water, soil, waste pipes, etc., to prevent sweating in warm weather and freezing in cold weather and for soundproofing. Manufactured in $\frac{1}{2}$, $\frac{3}{4}$ or 1-in. thickness.

Also made up in special thicknesses and constructions for drinking water, exposed piping and extraordinary conditions.



"Stamco" Laminated Asbestos Felt and Sponge Covering

For covering high pressure and medium pressure steam lines. Especially adapted for vibrating lines or pipes running out-of-doors. Composed of successive layers of asbestos

paper with a sponge-like material imbedded into and forming part of the felt itself so as to provide maximum insulating value.

Manufactured in standard 3-ft. sections, from 1 to 3 in. thick, and can be furnished with a roofing jacket for out-of-doors.



THE STANDARD LIME AND STONE CO.

INSULATION DIVISION

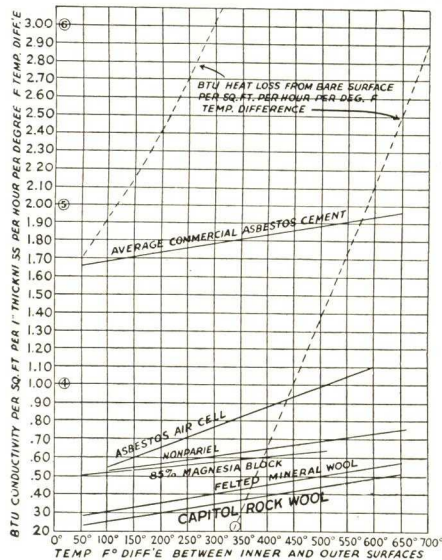
First National Bank Building, BALTIMORE, MD.

Capitol Rock Wool Products for Insulating Heat, Cold, Sound

Commercial Rock Wool; Granulated Rock Wool; Rock Wool Rolled Felt; Rock Wool Bats; Rock Wool Blankets; Rock Wool Blocks; Rock Wool Pipe Coverings; Rock Wool Insulating Cements; Rock Wool Finishing Cements.

Capitol Rock Wool Insulation

All Capitol Rock Wool Insulations embody two important advantages: (1) Longer and larger fibres, resulting from unusual



character of rock used; (2) Lighter wool with greater insulating effectiveness because produced by newer methods of blowing and fabricating. The result is unusually low thermal conductivity—that of felted blankets being only 0.240 b.t.u. per sq. ft., per 1 in. thickness, per degree F. of temperature difference, per hour!

The chart, based on bulletins compiled by recognized testing laboratories, shows the amazing efficiency of Rock Wool in comparison with other insulating materials. Capitol Rock Wool assures efficient, economical insulations.

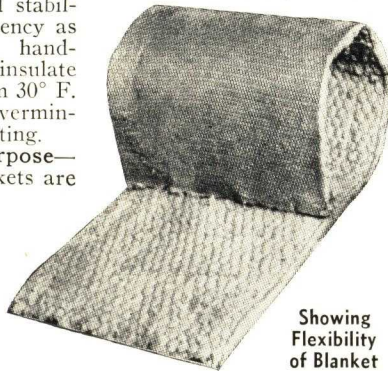
Capitol Rock Wool Blankets

Actually felted to a uniform density of 11 lbs. per cu. ft. This gives them unusual stability and exceptional efficiency as compared to ordinary hand-packed blankets. They insulate against temperatures from 30° F. up to 1250° F. Fireproof, vermin-proof and moisture-resisting.

Styles for Every Purpose—

Capitol Rock Wool Blankets are made in a great variety of styles, to care for every problem that might arise from unusual shapes to be insulated. In other words, some are rigid, some are flexible, some combine rigidity in one direction with flexibility in the other. Others provide air space between insulation and insulated surface. This prevents overheating of an excessively hot area by permitting free circulation.

Sizes for Every Need—Available in standard sizes 2x4 ft. or 2x8 ft. of any thickness from 1 to 6 in. and in any special sizes within these dimensions.



Showing Flexibility of Blanket

Capitol Rock Wool Insulating Cements

Capitol Rock Wool Insulating Cements were developed for special needs where a plastic form of insulating would be most suitable and a monolithic covering was desired. These cements are merely mixed with water and applied with an ordinary trowel. No finishing coat is required.

No. 52, High Temperature Capitol Rock Wool Insulating Cement

For insulating temperatures up to 1650° F. Inexpensive, highly efficient, easy to apply, and reclaimable. Requires no special finishing coat, being easily troweled to a uniform appearing white surface. Has many times the insulating value of ordinary asbestos cement. When properly applied, it has practically no shrinkage and, therefore, will not readily crack or lift off. Adheres so snugly that vibrations do not affect it. Its own structural strength makes reinforcement unnecessary up to 1½-in. thickness. Resiliency adds to its toughness. Not only high in insulating value (thermal conductivity 0.650 b.t.u.), but also in covering power. 100 lbs. will insulate approximately 52 sq. ft., 1 in. thick. Comparative laboratory tests show 20% greater covering capacity and higher efficiency. Technical data on request.

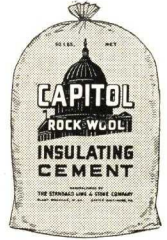
No. 49, Low Temperature Capitol Rock Wool Insulating Cement

For temperatures from 40° to 500° F. This remarkable insulating compound has countless applications. It provides practical, economical, and efficient fireproof duct insulation in plastic form; requires no special finish. Ideal for back walls and sides of radiator enclosures; and also for pipe fittings. Also used as a coating over Capitol Rock Wool Blankets on boilers, etc. Gives a hard, durable finish of unusual insulating efficiency and neat appearance. Thermal conductivity of only 0.70 b.t.u. per sq. ft., per hour, per degree F. temperature difference! 100 lbs. will cover approximately 49 sq. ft., 1 in. thick.

Capitol Rock Wool Finishing Cement

Developed for use as a finishing coat over No. 49 or No. 52. Not used as an insulation, but applied thin and troweled to a hard, beautiful, durable finish. It covers approximately 35 sq. ft., ⅜ in. thick per 100 lbs.

Cement Specifications—Supplied in 50-lb. bags, easily handled and stored.



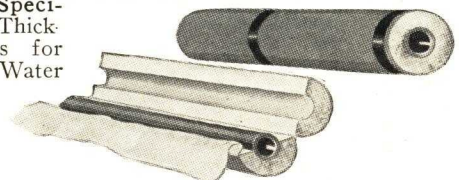
Cement	No. of 50-lb. bags per ton	Coverage per ton 1-in. thickness
No. 52	40	1040 sq. ft.
No. 49	40	980 sq. ft.
Finishing	40	300 sq. ft.

Capitol Rock Wool Pipe Coverings

Made to stand up under any and all insulating conditions. They are just as effective for guarding extreme cold of refrigeration as for extreme heat of high pressure and superheated steam. Fireproof, vermin-proof, and practically indestructible. Can be used on any job with definite assurance that there will be no upkeep expense and that they will provide insulation as nearly theoretically perfect as it is possible to achieve.

Canvas Covered or Waterproofed—Wool Pipe Coverings are made in 36-in. sections perfectly moulded to snugly fit the pipe. Sections are split ready for application and are held in place by metal bands over joints and at mid-sections. Can be removed and replaced without damage. The two types of Capitol Rock Wool Pipe Coverings answer every insulation requirement from 60° below zero to 1250° F. The *Canvas Covered* type is best suited for interior use on steam and hot water lines; the *Waterproofed* type, to withstand the severe conditions when exposed to elements—wind, rain, snow, and ice.

Pipe Covering Specifications—Proper Thickness Specifications for Steam and Hot Water Lines, Cold Water, Ice Water Lines and Refrigeration will be sent upon request.



Pipe Covering Opened

SWEET'S ENGINEERING CATALOGUES

SECTION 3

MATERIAL HANDLING AND POWER TRANSMISSION

ELEVATING AND CONVEYING EQUIPMENT

ESTABLISHED 1903

F. S. PAYNE CO.

Elevator Manufacturers

Richdale Avenue, CAMBRIDGE, MASS.

BOSTON, MASS.

FRANKLIN, MASS.

BRANCH OFFICES
LOWELL, MASS.

PROVIDENCE, R. I.

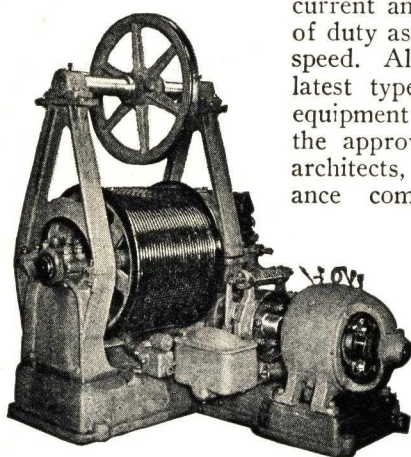
NEW HAVEN, CONN.

Products

ELECTRIC and HYDRAULIC ELEVATORS: Passenger and Freight; Multivoltage; Collective; Automatic Control; all types of Manual Control. ASH HOISTS.

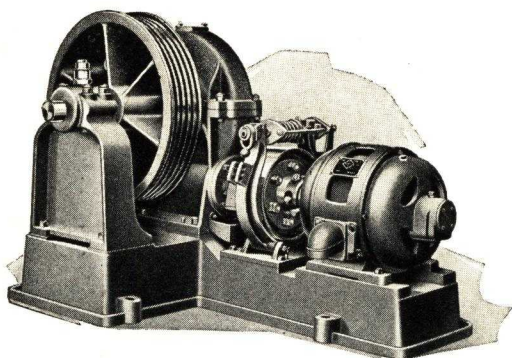
Also manufacturers of Electric Dumbwaiters.

Electric Elevator Machines



Direct Current, Direct Connected Electric Worm Gear Drum Machine

Prompt deliveries and a refined product are assured by our policy of standardizing the design of all our machines.



Direct Connected Electric Worm Gear Traction Machine

Hydraulic Elevator Machines

Hydraulic plunger elevators which can be adapted to meet any requirements are manufactured by this company.

Information Desired for Estimates

The opportunity to co-operate with architects, engineers and owners will be appreciated either in furnishing preliminary plans and specifications or comparative costs of electric and hydraulic equipments. To avoid delay and to insure intelligent response to inquiries the following information should be furnished:

Travel of car: distance between bottom and top landings. Maximum load to be carried; if a freight elevator, materials to

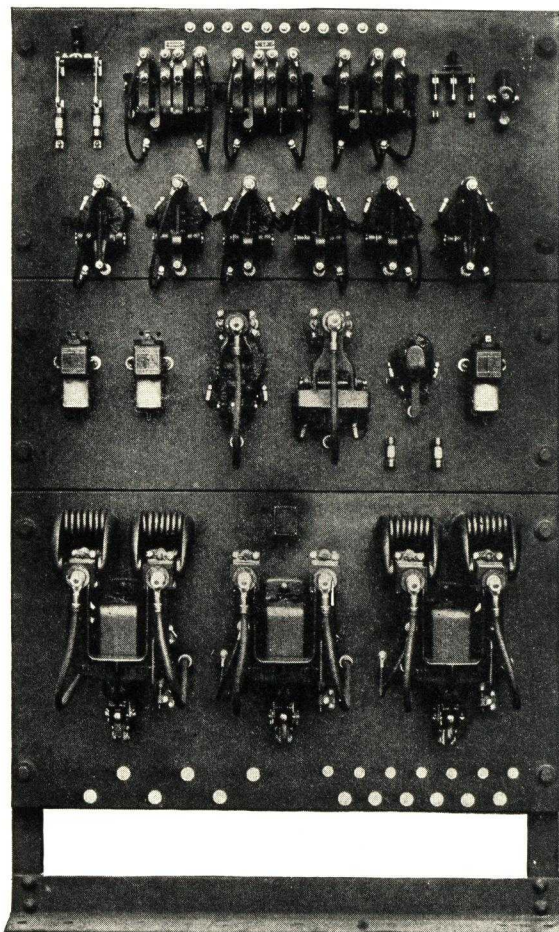


TRADE-MARK

be carried. Approximate speed and type of control desired. Size of car required or size of hoistway provided. Construction of hoistway: brick, concrete, steel or wood. Number and size of openings at each floor, and side or sides of hoistway where openings are located.

If electric elevator, state location of space provided for machine: in penthouse over hoistway or adjacent to hoistway at lowest landing. If hydraulic plunger elevator, advise nature of soil: gravel, sand, salt marsh or rock; give water pressure. For electric elevators, give current available, whether direct current or alternating current; if direct current, state voltage; if alternating current, state voltage, phase and cycles.

Where wooden freight elevator gates are required, state number and type: full automatic or semi-automatic; also, if gates are to be single or double bar, or slatted.



Payne Variable Voltage Elevator Controller

Payne Patented Hydraulic Ash Hoists

Designed for use wherever differences in grade necessitate the use of a hoist for the removal of ashes.

References

American Thread Co.
American Woolen Co.
Swift & Company
Turner Construction Co.
Lockwood Greene Engineers, Inc.
Cadillac Automobile Co.
Monks & Johnson
The Foxboro Co.
Albert Kahn, Inc.

New England Confectionery Co.
Colt's Patent Fire Arms Co.
Dennison Manufacturing Co.
United States Rubber Co.
Standard Oil Co. of New York
United States Gypsum Co.
New England Power Association
Walworth Manufacturing Co.
Stone & Webster Engineering Corporation

ESTABLISHED 1887

ENERGY ELEVATOR COMPANYTELEPHONE
MARKet 0821

210-218 New Street, PHILADELPHIA, PA.

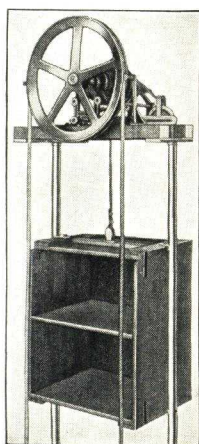
AGENTS IN ALL PRINCIPAL CITIES

ProductsDUMBWAITERS, HAND-POWER and
ELECTRIC.SIDEWALK ELEVATORS, HAND-
POWER and ELECTRIC.

FREIGHT ELEVATORS, HAND-POWER and ELECTRIC.

Write for complete catalogue containing descrip-
tions, diagrams and shipping data.**Energy Features**

Energy vertical transit equipment is backed by over 45 years of engineering experience and performance. It is characterized by simplicity of design, adaptability to varying industrial conditions. Tested materials of adequate strength or wearability, plus careful workmanship, have resulted in the long and satisfactory service for which Energy Equipment is noted. All Energy Equipment is designed and fitted for easy erection by local mechanics.

Energy Hand-operated Dumbwaiters

The table below suggests types for various capacities, but the complete Energy line comprises hand-operated dumbwaiters for every practical purpose, or to meet any building condition, such as service openings on opposite side of the shaft, etc.

Energy features include fully assembled machines, geared for operation with least effort, mounted on rigid frames to preserve perfect alignment of all parts and equipped with roller bearings wherever it will aid operation.

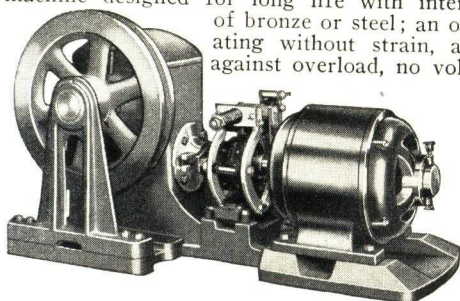
All Energy Dumbwaiters are equipped with brakes. Types 413, 432, 632, 1063, and their variations have a special automatic brake which sustains the fully loaded car at any point, but which applies to downward movement only, being free of all friction on the up motion.

Complete catalogue describing all hand-operated dumbwaiters on request.

Energy Electric Dumbwaiters

Energy Engineers have perfected a new electric type which offers many advantages.

Among these advantages are quiet operation; any practical speed and capacity desired; a traction drive machine designed for long life with internal working parts of bronze or steel; an oversize motor operating without strain, and fully protected against overload, no voltage and phase reversal; full call and send push button control that is inoperative while car is in motion. Write for Bulletin 411 giving complete details.

**Hand-operated Sidewalk Elevators**

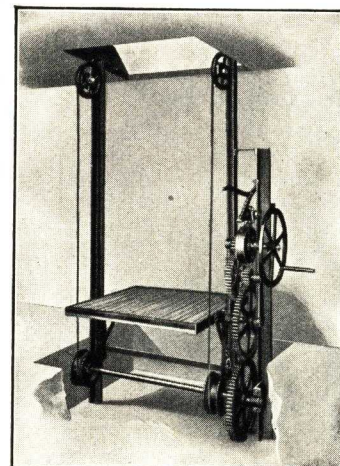
Energy Sidewalk Elevators are designed for maximum operating freedom. The machines can be located either directly beside the car, or within the building line, making various

arrangements possible.

Machines are rigidly mounted, with smooth running gears and equipped with self-holding counter-balanced brakes. They utilize an operating wheel, instead of usual crank, for ease and safety of operation.

Cars are of steel frame construction, with diagonal reinforcements and double wood floor. They travel on two heavy structural angles, which act as steady guides and support the main bearings and overhead wheels.

Complete description, blue prints and prices of both hand-operated and electric types on request.

**HAND-POWER SIDEWALK ELEVATORS**

Capacity, lb.	Type	Car size, outside measurements, ft.	Size of door openings required, ft. in. ft. in.	Gear ratios	Operated from
1000	977	4 x 4	4-11 x 4-2	70-1	Side of shaftway
1000	1004	4 x 4	5-4 x 4-2	52-1	Front of shaftway
500	1002	3 x 3	3-8 x 3-2	35-1	Side of shaftway
500	994	3 x 3	4-0 x 3-2	35-1	Front of shaftway

Hand Freight Elevator, Type 992

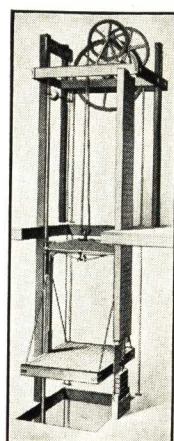
Capacities 500, 1000, 1500 and 2000 lb.

A strongly built elevator, scientifically designed and balanced to carry heavy loads without taxing the strength of the operator.

Machine gears are cast from cut steel patterns; shaft revolves on heavy steel rollers in reversible yoke bearings; brake is self-holding with double flange braking surface.

Hardwood car with frame tenoned and through-bolted, and braced with irons. Equipped with instantaneous safety catch of ample size to sustain car and capacity load.

Complete information, blue prints and prices of this or of Energy traction, belt or chain drive electric elevators, on request.

**SIZES OF HAND ELEVATOR, TYPE 992**

Maximum capacity, lb.	Car size (width and depth), ft.	Shaft size (width and depth), ft. in. ft. in.	Shipping weight, lb.
500	3 x 3½	3-11 x 3-8	1100
1000	3½ x 4	4-5 x 4-2	1400
1500	4 x 4½	4-11 x 4-8	1700
2000	4½ x 5	5-6 x 5-2	2100

ENERGY HAND-OPERATED DUMBWAITER DATA

For a lifting capacity of, lb.	Energy dumbwaiter	Standard car size (width x depth x height), in.	Maximum car size (width x depth x height), in.	Size of shaft for standard car, width x depth, in.	Service
25	Little Beauty—Type 362	20 x 16 x 30	24 x 20 x 30	26 x 18	High speed—brass tube Supplies from stockroom Materials, parts, etc. Heavier tools, boxes, food in quantity, etc. Trunks and heavy loads—platform car
50	Undercounter—Type 1063	20 x 16 x 30	30 x 24 x 30	28 x 22	
75	Energy—Type 632	24 x 20 x 30	36 x 24 x 30	29 x 23	
150-300	Heavy Duty—Type 432	30 x 24 x 36	9 sq. ft.	36 x 27	
300	Little Giant—Type 413	30 x 42 x 48 to headbeam	9 sq. ft.	38½ x 45	

All dumbwaiters and dumbwaiter cars subject to wide variations to fit service needs. Write for full information. Prices and drawings on request.

ESTABLISHED 1866

TELESCOPIC HOISTS AND PNEUMATIC TUBE SYSTEMS

HOISTS MADE BY
Gillis & Geoghegan, Inc.

TUBE SYSTEMS MADE BY
G&G Atlas Systems, Inc.

TELEPHONE
Spring 7-7800

537 West Broadway, NEW YORK, N. Y.

AGENTS IN FIFTY PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

ELECTRIC AND HAND POWER TELESCOPIC HOISTS AND ELECTRIC TROLLEY HOISTS



Model E Standard Heavy Duty Electric Telescopic Hoist, One of Two G&G Hoists at the Holland Tunnel, New York-New Jersey
212 G&G Telescopic Hoists are in use in Bell Telephone Buildings throughout the country



Electric Telescopic Hoists

G&G Electric Telescopic Hoists are designed for raising and lowering loads under 1000 lbs. at industrial plants; for removal of ashes and rubbish from all types of buildings; for quickly and economically raising and lowering bags, bales, barrels, baskets, boxes, cans, carboys, ice, machinery parts, rolls, trays and other loads within their scope.

No part of a G&G Hoist has a factor of safety of less than 8, based on the maximum rated capacity as shown on the nameplate.

All parts have a factor of safety far beyond what is ordinarily considered necessary.

On special orders, G&G Hoists can be built with a maximum rated capacity of 1000 lbs.

Boiler Room-to-Grade Level Telescopic Hoist—The Model Electric has a maximum capacity of 500 lbs. at a speed of 60 feet per minute and is equipped with a 1½ hp. motor a-c. or d-c.

Boiler Room-to-Truck Height Telescopic Hoists—This electrically operated overhead crane hoist is for use in buildings where grade level approach permits trucks to drive up along-side of hoistway leading to boiler room.

Made in two models: Model D for Stand-ard Heavy Duty, and Model D-3 for Intermediate Duty.

Both have a maximum load capacity of 300 lbs. at speed of 60 feet per minute, and a motor of 1½ hp. a-c. or d-c.

Model D can also be constructed for a maximum working capacity of 500 lbs.

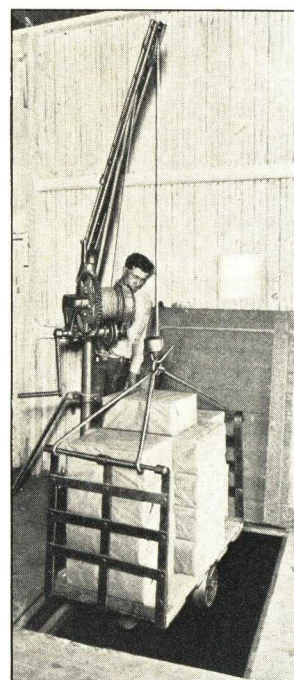


Hand Power Telescopic Hoists

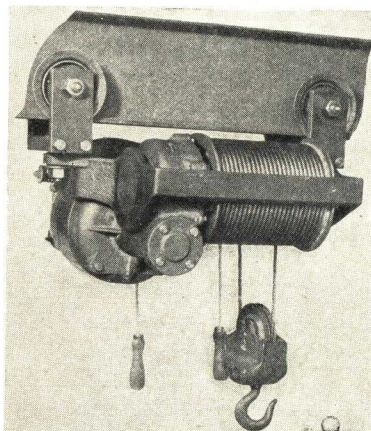
Boiler Room-to-Grade Level, Model A—With this G&G Hoist, one man performs the entire operation of raising and lowering loads when G&G Fixed Bail Cans are used. Both the telescoping and hoisting handles act on compound gears. Loads of 500 lbs. are raised at speed of 30 feet per minute, requiring a manual pressure on hoisting handle of only 7 lbs. for each 100 lbs. raised. Hoisting head, mounted on ball bearings, swings clear of hoistway, permitting operator to deposit loads on grade without lifting can. While cans are being lowered, hoisting handle *does not revolve*, assuring rapidity in lowering cans as well as protection to operator.

Boiler Room-to-Truck Height, Model B—Overhead

crane permits load to be raised from boiler room or basement to point high enough to dump directly into truck, railroad car or container without rehandling at grade level. Loads of 300 lbs. are raised at speed of 30 ft. per minute. Both telescoping and hoisting handles act on compound gears. A manual pressure of only 7 lbs. on hoisting handle is required to raise each 100 lbs. of load. Hoisting handle *does not revolve* while brake is being used in lowering load by gravity.



Model B Non-Telescopic Hoist at Great Western Paper Box Co., St. Louis, Mo.



G&G Electric Trolley Hoists

Its compact construction permits the G&G Electric Trolley Hoist to be used where limited headroom is a factor. The hoisting unit is enclosed, and is equipped with an automatic upper limit. Roller and ball bearings on both worm and drum shafts as well as automatic lubrication is provided. Can be furnished for either hook or trolley mounting. Capacities from 1000 to 10,000 lbs.

PNEUMATIC TUBE SYSTEMS

The G&G Atlas Pneumatic Tube Systems are used in all buildings where routine business must be transacted between widely scattered departments, or where convenience or economy demands speedy transactions. Order forms, mail, invoices, vouchers, stocks, bonds, miscellaneous warehouse and factory forms, even light-weight articles and containers including liquids are dispatched from one point to another at a speed of 30 feet per second in a horizontal or vertical position. Tests have shown that mechanical messenger service provided by G&G Atlas pneumatic dispatch tubes is many times faster than foot messengers.

In plants or offices where it is the practice for foot messengers to make



routine pick-ups and delivery trips to all points at regular intervals, or where special trips are required, greater efficiency can be attained with a tube system. The location of stations, and conditions under which lines must be run will vary in each building. Tube systems may be installed in new buildings or in existing structures without interrupting operations.

Our engineers will make a survey and offer an installation plan that conforms to existing requirements. For new buildings to be constructed, it is suggested that the architect or engineer consult us so that proper space may be allowed and a system laid out to efficiently meet individual requirements.

THE ALLINGTON & CURTIS MFG. CO.

LEADERS SINCE 1886

Dust Collecting and Pneumatic Cleaning, Unloading and Conveying
Wood-fuel Stokers, Storage Vaults and Unloaders

SAGINAW, MICH.

FACTORIES: 1500 Holland Avenue, SAGINAW, MICH.; 321 Rutherford Avenue, BOSTON, MASS.

SALES AND ENGINEERING: SAGINAW, CHICAGO, NEW YORK, BOSTON

Products and Services

We design, manufacture and install efficient systems for:

GATHERING SHAVINGS, SAWDUST, HOGGED REFUSE, LEATHER, METAL and STONE DUSTS, LINT FROM TEXTILES, PAINT FUMES, etc.

CONTROLLING FINE DUSTS.

CLEANING LINT and DUSTS FROM TEXTILE MILLS, FACTORIES, GRAIN ELEVATOR FLOORS, WALLS and MACHINERY.

CONVEYING BULK MATERIALS LONG DISTANCES.

UNLOADING GRAINS, etc., FROM BOATS, CARS, etc.

AUTOMATICALLY FEEDING WOOD FUEL TO FURNACES.

STORING and REHANDLING SHAVINGS, CHIPS, etc.

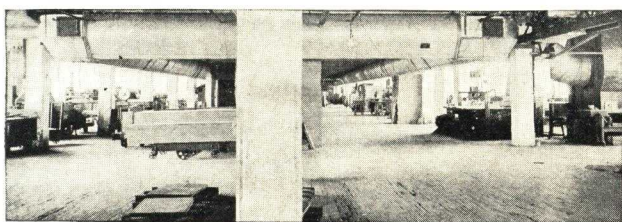
We developed and manufacture the slow-speed low-power exhaust fan; do general sheet metal work; electric and acetylene welding.

We advise savings possible by modernizing existing systems; help plan new projects; design systems guaranteed to work as intended and efficiently; manufacture in our own plants the parts needed to exactly suit conditions, and send experienced men to install the apparatus.

Forty-seven years exclusively in this special line gives us experience on almost any problem involving pneumatic features. No project too small for careful attention, though we have installed the largest systems in the United States and Canada.

Gathering Systems

For grinding, buffing on metal, leather, etc., for woodworking, textile mills, etc., wherever there is a dust problem with conveying. Systems of several kinds, as may best suit initial and probable future conditions to gather the dusts and materials.



Three Sides of a Circuit Main

One of the exhaust fans shown at right. This plant also has two A&C Stokers, an A&C High Pressure Conveyor and three Storage Vaults

All-Pneumatic System—Air suction draws materials through tapered pipes. The method used since 1886. Still used in plants not wanting flexibility or highest efficiency. Modern improvements include adjustable suction in branches; special collector eliminating centrifugal resistance and back pressure on fan.

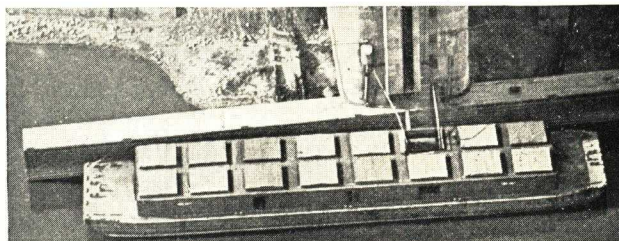
Semi-Clearing Main—Directed air currents, boost materials along an over-size main. Is all-pneumatic. Gives some flexibility for light materials, with mains not too long.

Mechanical Self-Clearing Main—The invention that revolutionized dust collecting. Remarkable savings in maintenance, depreciation and power. Unlimited flexibility. Shift, remove or add machines without changes in main, loss in efficiency, or lost production, even when fan capacity is added; results obtainable in no other way. Fans keep the main under vacuum and the air current in each branch carries materials the short distance to the main, but in the main the concentrated mass of materials is moved by a mechanical conveyor, slowly, but positively to the exit. Since the conveying is independent of air supply, the main is not tapered and is large, to accommodate all machines that could be crowded into the floor space. No adjustments or air leakage or clearing by hand. Eliminates the serious losses and limitations of air suction conveying.

Circuit Main—An endless duct, mechanically cleared. The latest and greatest development. Twice the capacity of single mains of the same size. Saves headroom. Routed anywhere. A simple way to remodel all-pneumatic systems to secure reliability, efficiency, mobility and permanence. Existing fans, collectors and discharge pipes can be used without moving them.

High Pressure Conveyors—Pulp chips, shavings, sawdust, hog refuse, wet bark, grain, seeds, etc.; large volumes; distances up to 5000 ft. In-

cludes a positive blower; a pipe 12 in. or smaller above or below ground; collector at the end; A&C Charger that receives material by gravity and introduces it into the pipe line against pressure therein without air leakage. Positive blowers build up pressure instantly to overcome any tendency toward clogging, thus supplying the safety factor, but only when needed and without wasting power.



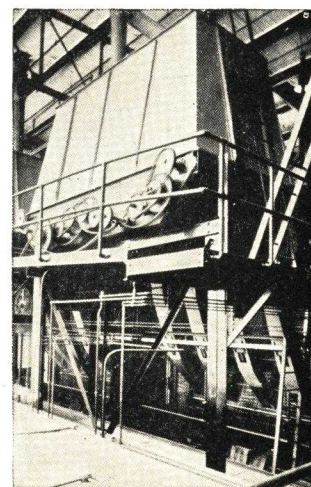
Unloading Grain from a Barge

Pneumatic Unloader—For grains, seeds, etc. Uses the same charger as high pressure conveyor, but in this case as a lock to discharge materials picked up through a suction nozzle. Stationary and portable systems.

Wood-fuel Stoker—For sawdust, shavings, hogged chips, wet bark, etc. A non-arching magazine takes up fluctuations in fuel supplied at varying rates. Special screw conveyors feed the fuel at uniform rate, without air blast, delivering to furnace by gravity. Feed regulated by boiler pressure to suit fire needed. Correct fuel and air supply eliminates smoke nuisance and greatly increases steam per pound of fuel. Even furnace temperatures lengthen life of furnace. Higher ratings. Holds boiler pressure steady. Less labor in boiler room.

Fine Dust Controller—A dry method of catching dust that escapes from ordinary collectors—wood flour, fly ash, etc. No screens to build up back pressure. No liquids, or parts that require periodic replacement.

Storage Vault—It is now practical to use shavings, sawdust, hog chips, as standby fuel. Capacities to 250,000 lbs. Patented design eliminates arching. Oscillating rotary unloader. Rehandling is automatic without manual labor.



A 4-Feed Wood-fuel Stoker

This plant has also three A&C Oscillating, Rotary Unloaders, an A&C Self-clearing Gathering System and A&C High-pressure Conveyor



A&C Storage Vault at Right

High-pressure Conveyor delivers to A&C collector above two A&C Stokers in the boiler house at the left

BLAW-KNOX COMPANY

Manufacturers of Framed Cloth Bag Type Dust Collectors

2074 Farmers Bank Building, PITTSBURGH, PA.

For Sales Offices, see Steel Grating Pages; for Other Products, see Manufacturers' Index

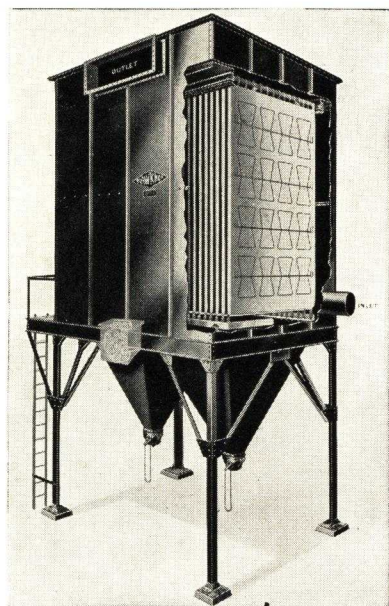
BLAW-KNOX FRAMED CLOTH BAG TYPE DUST COLLECTORS

Used for Handling All Kinds of Dry Industrial Dusts and Fumes

Chief Characteristics

The Blaw-Knox Framed Bag Type Dust Collector supplies a demand for extremely high quality equipment at low cost, both when initial investment is considered and also operation and maintenance expense. Its chief characteristics and points of economical value are as follows:

- (1) Simplest Cloth Seal—wrapping type. Two bolts only required for assembly. No tacks, nails or screws used.
- (2) Fewest parts per square foot of cloth area.
- (3) Greatest unit of capacity (largest cloth area per square foot of ground).
- (4) Largest cloth area per lineal foot of arrester.
- (5) Smallest number of hoppers per square foot of ground area.
- (6) Smallest requirement for supplementary equipment, per unit of capacity.
- (7) Lowest weight per unit of capacity.
- (8) Unique and exclusive cleaning mechanism.
- (9) Simple cloth changing arrangements.
- (10) Extreme accessibility.
- (11) Long cloth life.
- (12) Minimum erection cost.



Blaw-Knox Framed Bag Dust Collector

General Description

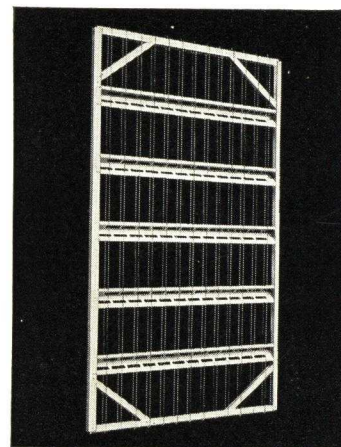
The basic standard unit consists of cotton cloth bags, stretched over steel separating and beating frames.

For special applications, wool or asbestos cloth may be used and wood frames may be substituted for steel frames where desired.

The housing or casing of Blaw-Knox Framed Bag Dust Collectors is built from sheet steel, is weather and dust-tight and may be installed in either interior or exterior locations.

The use of metal frames in these Collectors permits the use of wool cloth to handle dust and gases to resist chemical reactions destructive to cotton.

Asbestos cloth bags are furnished for temperatures up to 500° F. and this material has the further advantage of being resistant to many alkaline as well as acid materials and gases.



All-steel Separator Frame

Blaw-Knox Engineering Service

Blaw-Knox invites you to call on its engineering experience which is rendered without obligation.

This includes examination, investigation and report on dust collection problems; measurements of air, gas and dust quantities to accurately establish dust collector requirements.

In purchasing Blaw-Knox Dust Collectors, you are buying complete jobs from one house with undivided responsibility.

Some Uses of Blaw-Knox Dust Collectors in Industry

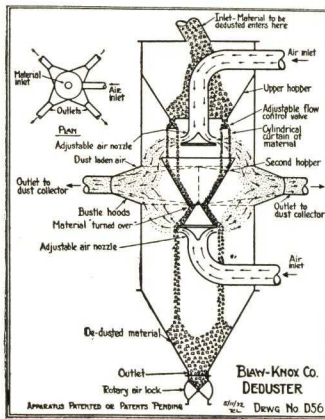
Abrasives	Cement Dust	Feeds	Granite and Stone	Lithopone	Sanders
Alkali	Charcoal	Feldspar	Cutting	Marble	Sand Blasts
Asbestos	Chemicals	Fertilizer	Graphite	Mica	Shellac (dry) Sys.
Asphalt Filler	China Ware	Fibre	Grinders, Buffers	Pigments	Silica
Bakelite	Coal	Flour	and Polishers	Potteries	Slate Dust
Baking Powder	Cosmetics	Fly Ash	Gypsum	Pulp (Wood Pa-	Soap
Brick Dust	Dryers	Fullers Earth	Hard Rubber	per)	Starch
Bronze Powder	Emery	Fur and Felt	Lead Sinter Dust	Quartz	Sugar
Cast Iron Dust	Enamel	Glass Plants	Leather	Rags (Waste)	Tobacco

BLAW-KNOX DE-DUSTER

The Blaw-Knox De-Duster is an arrangement for removing fines and dust from sand, stone and coal at an extremely low cost per ton.

The illustration (right) is fully explanatory of the operation which is given as follows:

Material from 1½ in. down is dropped through the inlet at the top into the upper hopper. It then runs through a circular feed box over the adjustable flow control valve where it is split up into two cylindrical curtains. As the curtains fall, an air screen issuing from the circular air nozzle, blows the dust and fines out. The larger, or cleaned particles, fall down into the second hopper, where they are turned over and then fall on the cones, which forms them into another cylindrical curtain. This curtain passes through a second air stream for further air cleaning—



completing the cleaning. The dust and fines are carried off to the "bustle" hood surrounding the De-Duster. The air, containing dust and fines, is carried to a Blaw-Knox Framed Bag Dust Collector, described above, where it is graded and completely collected in dry, usable form.

The Blaw-Knox De-Duster is of heavy construction—the shell and hoppers being made of ¼-in. plate to resist abrasion and give long life.

The piping is standard.

You are invited to write for further information about a Blaw-Knox De-Duster adapted to meet your own conditions.

This equipment pays for itself in a remarkably short space of time and then begins to show a substantial profit from the sale of graded fines and dust.

THE BRADY CONVEYORS CORPORATION

20 West Jackson Street, CHICAGO, ILL.

OFFICES IN ALL PRINCIPAL CITIES

Products

BRADY EQUIPMENT, including: Steam Jet and Pneumatic Conveyors, Sluicing Systems, Cast Iron Water Drain, Ash-gates and Hoppers, Coal and Ash Handling Elevators.

Brady Screw Conveyors.

Also Skip Hoists, V-Bucket Conveyors, Track Hoppers and Feeders, Weigh Larries, Belt Conveyors, Apron Conveyors, Platform Conveyors, Package Conveyors and Elevators, Flight Conveyors, Gravity Discharge Elevator-Conveyors, Bin Gates, Flat Suspended Furnace Arches, Hydraulic Ash Conveyor Systems, Dust Collecting Systems.

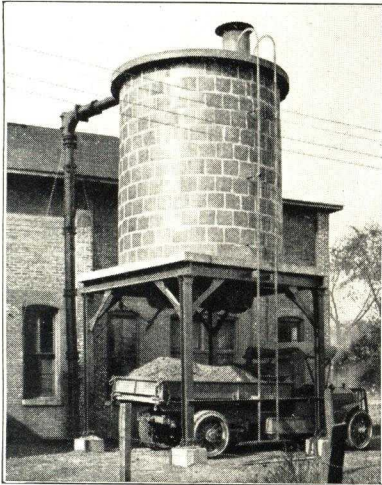
Brady "Jetveyors"

Consist of a pipe line made to withstand the severely abrasive action of the ashes being conveyed. The line extends from the ash pit doors to the desired point of ash disposal.

Ashes are simply shoveled into ash intake openings in the conveyor line and are conveyed by suction of air at high velocity created by a steam jet.

The "Jetveyor" is operated by a Brady Venturi Jet placed at the discharge end of the line, thereby handling the ashes dry to the tank. This eliminates freezing and packing in the tank.

The pipe of the Brady Steam "Jetveyor" may be run at any angle, elevation or level. This makes it adaptable to any building construction.



Brady Pneumatic Conveyors

Conveying of material by air is simple, efficient and economical. When the apparatus is properly designed, it is applicable to a great variety of materials handled in many kinds of manufacturing plants.

Pneumatic conveyors will unload granular and pulverized materials from cars and ships and transfer materials direct from one mill or machine to another, or to storage bins. Labor cost in such operations can be greatly reduced, for a single workman can replace a whole gang of laborers.

Pneumatic conveyors possess so many important advantages over any of the existing types of mechanical conveyors, as to much more than counterbalance the somewhat higher power cost incident to their operation.

In making inquiries, please give all information that will enable us to see the problem as you see it, and we will hold data in strict confidence and your inquiry will receive prompt and careful engineering attention.

General—Depending on the problem under consideration two general types of pneumatic conveyors are usually used—pressure or suction system; although in some cases a combination of the two is employed.



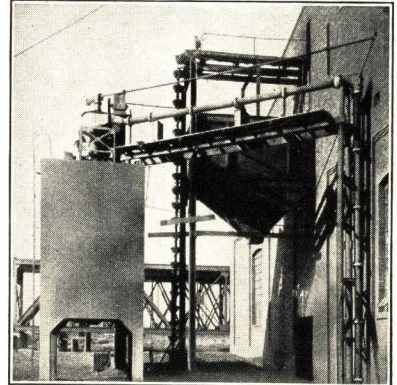
Pneumatic Car Unloader

Pneumatic systems effect a considerable saving in the number of men required for handling any material. The system is simple and requires no skilled mechanics for operating. Very little space is needed for the complete equipment of a Brady System. Pipes may be arranged to be carried over or under streets and through buildings to dodge obstructions, which is not possible with other types of conveyors.

Brady Ashveyor Steam Vacuum Systems

This type of system is used extensively in the conveyance of ashes from boiler room to storage tank. It is steam operated, but the difference between it and a steam jet ash conveyor is that the ashes are handled dry to the tanks, thereby preventing freezing and packing of ashes in the winter time.

The system to the right is a steam vacuum with a special airtight chamber and discharger mounted on top of a tank. If a storage tank can be made airtight, such a unit is unnecessary.



Brady Elevators

For smaller capacities which do not justify the high cost of a skip hoist an elevator is a suitable machine for handling coal or ashes.

Elevators are built in three designs: centrifugal discharge, continuous bucket, and perfect discharge. The centrifugal discharge elevator is the cheapest in first cost but runs higher in maintenance cost than the other types. It runs at a speed of 200 to 250 ft. per min. It is noisy and not suited for buildings where noise is objectionable.

The other two types are higher in first cost and run at a speed of 80 to 125 ft. per min., giving longer life, and are less noisy. Elevators generally have the buckets mounted on chain. Where gritty material is handled a belt is used in place of chain. The illustration shows an efficient method of solving the problem of handling coal in a small boiler plant. The coal is elevated from the track hopper into a storage tank and later discharged into inside live storage.



Brady Screw Conveyors

Screw conveyors are made in diameters of 3 to 24 in. in steel and cast iron. They are used for handling cement, coal, grain, ashes and similar materials.



Literature

We will be pleased to send catalogues describing our products, on request. Ask for our latest Conveyor and Tank Bulletin.

THE DRACCO CORPORATION

FORMERLY

THE DUST RECOVERING & CONVEYING CO.

Engineers and Manufacturers

4061 East 116th Street, CLEVELAND, OHIO

DRACCO DUST COLLECTING AND FUME RECOVERY SYSTEMS

DRACCO

Dracco high efficiency collectors are constructed in various forms, all embodying a positive filter medium, to remove solids and dust of all kinds and degrees of fineness from air or gas. Filter equipment may be installed to remedy an unhealthy working condition due to dust or fume; to recover from stack discharge valuable solids otherwise lost; or to effect classification and recovery of fine solids as an integral part of a manufacturing process. The particular construction of filter to be recommended depends upon the nature of the dust problem, and the results required.

Fig. 1 shows the arrangement of constant suction Perfecto filters. Adjustable automatic cleaning of only one compartment at a time gives the advantages of 24-hour service with constant draft at the dust source. Any number of filter compartments operate in parallel; over 100,000 c.f.m. of gas from a single source are successfully handled in this manner.

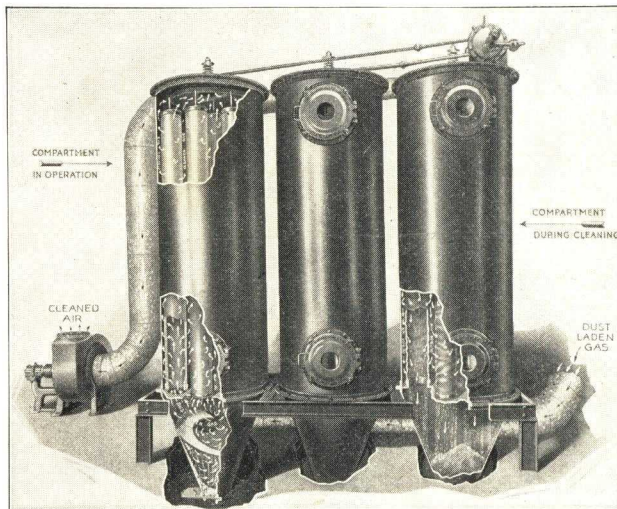


Fig. 1—Operation of Perfecto Continuous Suction Filters

Fig. 2 shows a battery of ten filter compartments, with other auxiliaries, to collect non-ferrous metallic oxides.

Cooling of gas is effected through the Dracco radiation tubes, and all auxiliary equipment is installed under one responsibility.

Fig. 3 shows a bag type collector, which economizes floor space and first cost where slight variations in draft are not objectionable.

For sand blast dust collecting and similar applications, this equipment is meeting increasing favor.

Atmospheric Air Filters—The Pollenair filter, a compact unit embodying a fabric filter medium, accomplishes the high efficiency cleaning of atmospheric air.

The filter is enclosed in a metal cabinet suitable for home or office installation and has a capacity of 200 cu. ft. of air per minute. Of special importance in the treatment of pollen asthma.

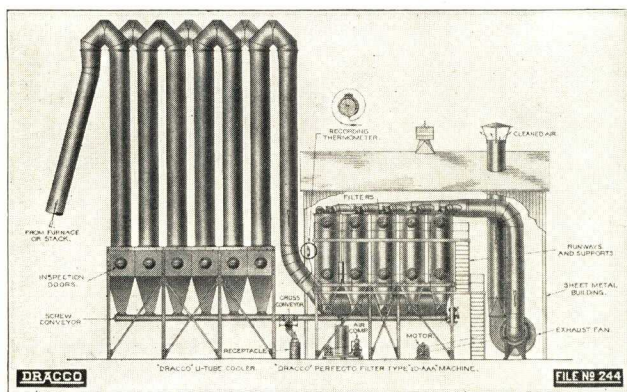


Fig. 2—Dracco Radiation Cooler and Automatic Filters for Fume Recovery in Non-ferrous Metal Smelting Field

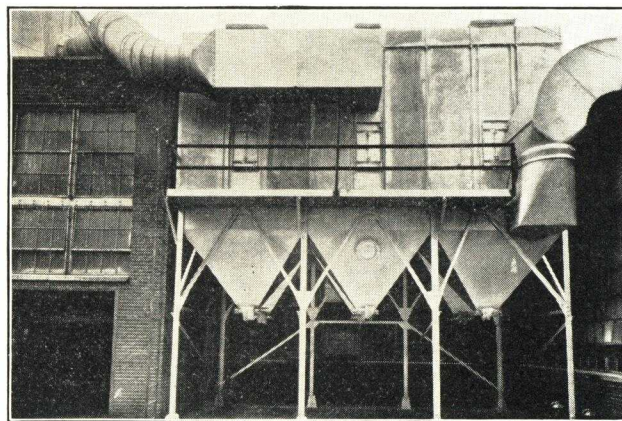


Fig. 3—Dracco Bag Type Dust Arrester

DRACCO PNEUMATIC CONVEYING SYSTEMS

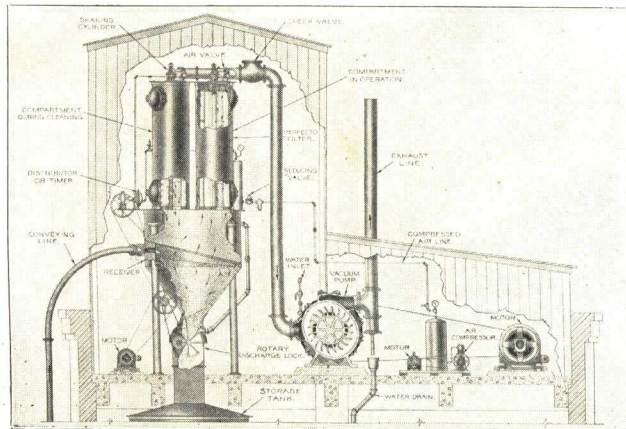
The illustration at the right shows the construction of a Dracco high vacuum conveying system. The conveying air and material are drawn into the receiver, where the coarse material is at once deposited. The dust and fines are carried up into the cloth filters, where they are separated from the air and precipitated to the receiver by an automatic filter cleaning mechanism.

Only clean air is exhausted through the vacuum pump, and a regular flow of material is provided by the discharge lock. Recommended for unloading from freight car to storage bin.

An efficient means of malt handling in new and existing breweries.

Low vacuum suction systems, and pressure systems of all kinds, are available where conditions require. Stationary and portable equipment to handle problems from large tonnages per hour down to small floor sweeping sizes have been in operation successfully for many years.

The Dracco patented gate type discharge mechanism makes it possible to handle pneumatically such difficult and abrasive materials as alum, ashes, pulverized ores, etc.



Operation Diagram of Dracco Pneumatic Conveyor

FULLER COMPANY

Manufacturers of Pneumatic Conveyors, Compressors and Vacuum Pumps
CATASAUQUA, PA.

Fuller Products

PNEUMATIC CONVEYORS for bulk materials.
DRY PULVERIZED MATERIAL PUMPING SYSTEMS (The FULLER-KINYON SYSTEM).

COMPRESSORS and VACUUM PUMPS.
Also Feeders, Weighing Batchers and Bin Gates for pulverized materials.

PNEUMATIC CONVEYORS

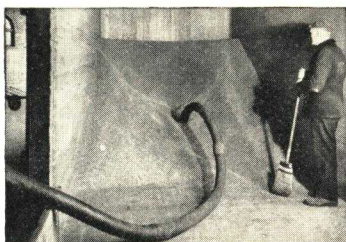
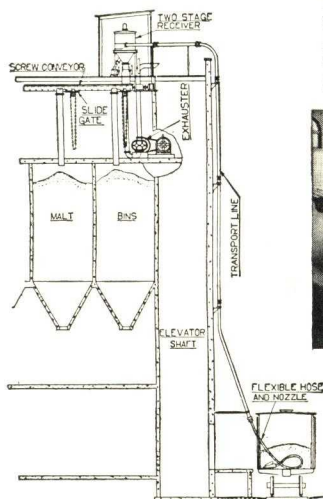
The FULLER COMPANY manufactures two distinctly different types of conveyors—the "Airveyor," a strictly pneumatic conveyor; and the "Fuller-Kinyon System," for transporting dry pulverized materials by pumping, the materials being aerated and forced through pipe lines by mechanical pressure.

The Airveyor

The *Airveyor* is commonly used for unloading fine, granular and crushed materials from cars and ships and for reclaiming from bulk storage and stock piles. Several hundred installations are now in service. With this system, the user of bulk materials can save the difference in cost between bag and bulk shipments and also decrease the cost of handling and storage. There is no loss of material, no dust nuisance and the hazard of silicosis and other dust diseases is avoided. One man can operate the system. Maintenance costs are negligible. Materials can be conveyed economically over long distances to avoid interference with buildings, equipment and traffic. The equipment can be installed without interfering with production. *Airveyors* are furnished in vacuum, pressure and combined types in a full range of capacities to meet all plant requirements. For fine or dusty materials, automatic filters are available in several types.

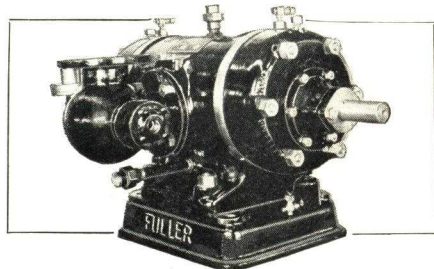
The Airveyor Conveys—

Alum	Gypsum
Arsenic	Lime
Bauxite	Malt
Crushed Coal	Resins
Dry Clays	Seeds
Flour	Silica
Fuller's Earth	Soda Ash
Grains	Whiting



Airveyor Suction Hose and Nozzle Unloading Malt from a Box Car

Note the cleanliness of the operation. The diagram at the left shows a typical layout unloading malt at a brewery. The installation shown has been in service four years without replacement of parts.



Single-Stage Compressor

The intake side of a single-stage compressor is shown above. All units are of a multi-vane type. The vanes, or blades, slide in radial slots in a rotor mounted eccentrically within the cylinder and form pockets of progressively decreasing volume toward the discharge.

ROTARY COMPRESSORS

Single and two-stage compressors are available in a full range of capacities up to 1600 c.f.m., actual delivery. Working pressures up to 125 lbs. gauge.

Among the unique features of these compressors are extraordinary capacity with reference to size, weight and floor space requirements; direct drive at common motor and gas engine speeds without reduction gearing; lack of vibration; air flow free from pulsation; few working parts; no valves, and negligible maintenance requirements with the ability to operate continuously at full load for long periods without mechanical attention. All parts are readily accessible.

VACUUM PUMPS

Single and two-stage Vacuum Pumps of the same general design are furnished for vacuums up to 29.75 in. referred to 30 in. barometer. Efficient over the entire range, they are unsurpassed at the higher vacuums.

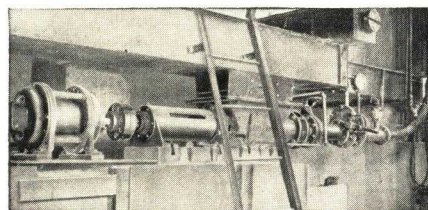
The Fuller-Kinyon System

From every cost consideration, power, price, erection and maintenance, *Fuller-Kinyon Systems* convey substantially all dry pulverized materials at the lowest cost per ton. Capacities range from 1 to 300 tons an hour. Present single systems are conveying cement as far as 3000 ft. and to elevations of 300 ft. and up to 48 receiving bins. They are standard practice in the cement industry and are widely used for other materials. The flexibility in layout simplifies plant design and makes this conveyor an ideal replacement for worn or obsolete mechanical systems. The pipe line is usually buried to avoid interference. Distribution to any number of bins in any desired sequence can be made automatically or subject to remote control.

Stationary Fuller-Kinyon Pumps convey from pulverizers, collector screws, bins, hopper-bottom cars, etc., load cars and ships. Portable pumps unload cement from cars and barges, and recover from warehouses.

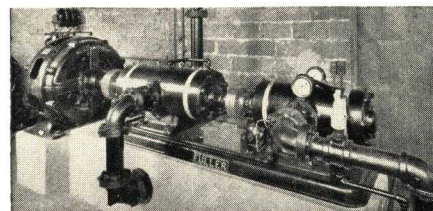
The Fuller-Kinyon System Conveys—

Alumina	Feldspar	Kaolin
Bauxite	Flint	Lime
Chalk	Flue Dusts	Limestone
Cement	Fuller's Earth	Manganese Dioxide
Clays	Graphite	Soda Ash
Coke Dust	Gypsum	Sodium Bicarbonate
Phosphate Rock	Starch	



A Type "F" Fuller-Kinyon Pump

In this installation the pump is conveying an especially fine and light flue dust, precipitated by a Cottrell System, from a collector screw to storage in three silos.



Two-Stage Compressor

The machine illustrated has an actual free air delivery of 750 c.f.m. compressed to 100 lbs. gauge.

Note the mounting of the two cylinders on a common base and the direct coupling to the motor (720 r.p.m.)

HOLLY PNEUMATIC SYSTEMS, INC.

452 Lexington Avenue, NEW YORK, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

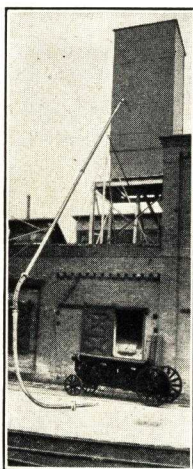
Scope of Holly Pneumatic Systems

PNEUMATIC CONVEYING SYSTEMS for handling bulk materials; INDUSTRIAL VACUUM SWEEPING SYSTEMS; COMPLETE DUST REMOVING and RECLAIMING SYSTEMS, including Automatic Suction Filters, Pressure Bag Filters, Rotary Gas Washers, Cyclone Separators and Cyclone Discharge Washers.

Some Materials Easily Conveyed Pneumatically

Cement, chemicals, clay, cocoa, coal, coke, copra, cottonseed, drugs, dyes, fertilizers, flue dust, grain, lime, malt, nuts, ores, phosphate rock, pigments, poisonous materials, salt, sand, scrap, seeds, soda ash, sugar, wood chips.

If you are receiving, producing or shipping any of the above or similar materials it will pay you to investigate the possibilities of Holly Pneumatic Systems. Our Sales and Engineering Departments are at your service.



Unloading Flint and Feldspar, General Electric Company, Schenectady, N. Y.

Users

Armour Soap Works
Dow Chemical Company
Great Northern Paper Co.
Hershey Chocolate Co.
Kellogg Co., Battle Creek
Royal Baking Powder Co.
Southern Ry. Systems
General Foods Corp.

Holly Pneumatic Conveyors

Advantages—Regardless of weather conditions the pneumatic conveyor insures constant, rapid flow of material, without dust, spillage or contamination, at a great saving in labor. Where the system can be applied there is no method that compares with it in simplicity, economy and dependability.

Types—Vacuum Type—The pneumatic suction system consists essentially of a nozzle, pipe line, recipient, pump and motor. Material is conveyed by means of a high velocity air stream, separated from the air in the recipient and discharged by gravity.

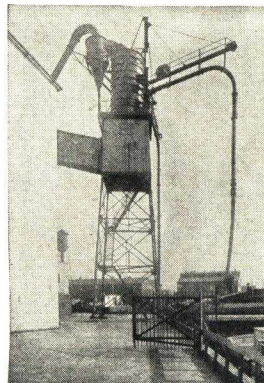
Holly Conveyors of this type are used for handling a large variety of materials from freight cars, barges and ships to storage, and from storage to machines. An automatic, self-cleaning filter on the recipient permits the conveying of the finest materials without loss.

Pressure Type—Ideal where gravity feed is possible. Material is fed into the line by means of a special feeder and ejector, conveyed to either a cyclone or pressure bag recipient and discharged by gravity. Where little dust is present no recipient is necessary and the material may be distributed by means of a flexible hose and nozzle.



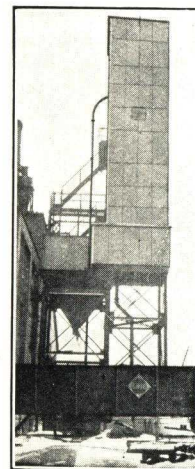
Unloading Bulk Cement, Carlton Company, Brooklyn, N. Y.

This concrete mixing plant uses the Holly Pneumatic System to unload bulk cement into an elevated storage bin



Conveying Grain, N. Y. State Barge Terminal, Brooklyn, N. Y.

This Holly Pneumatic Conveyor unloads 200 tons of grain per hour from boats to grain elevator



Handling Fine Clay Filtering Material, Vacuum Oil Company, Olean, N. Y.

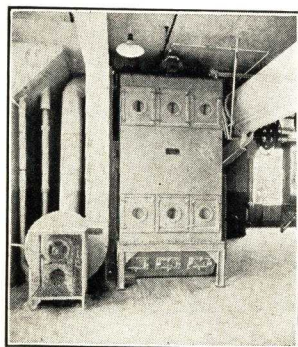
Users

Spencer Kellogg & Sons
Stone & Webster
Victor Chemical Co.
Westinghouse Elec. Co.
MacAndrews & Forbes
Edgar Brothers
P. Ballantine & Son
American Chatillon Corp.

Holly Industrial Vacuum Sweeping Systems

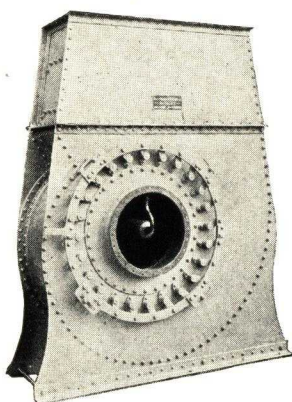
Adaptations of the principles of Holly Vacuum Type Conveying Systems to the problems of industrial sweeping offer a complete and economical solution.

Among the interesting applications of these systems is their growing use in Central Power stations and factories to collect and recover spilled material from floors, and dust deposits from walls, machines, etc. The parts of this system are substantially those of the vacuum conveyor with special clean-up tools.



Holly 3-compartment Automatic Cloth Suction Filter

One of two Holly installations in the R. B. Davis Co. plant at Hoboken, N. J., makers of baking powder



Holly Rotary Gas Washer

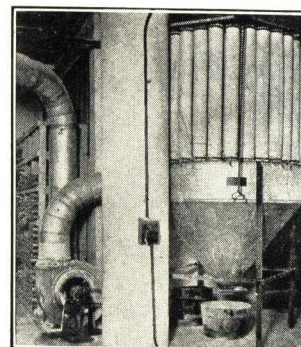
Used for recovering dust from hot gases

types, from the simple cyclone separator to the highly efficient automatic suction filter, allows us to supply the apparatus best fitted to your specific conditions.

Holly Dust Removing and Reclaiming Systems

The Holly staff of engineers, trained both in the laboratory and in the field, are prepared to apply over 20 years of practical experience and the latest scientific methods and investigations to the solution of your particular dust problems.

The variety of dust collecting equipment developed by the Holly organization, in dry and wet



Holly Pressure Bag Filter

Recovering 250 lb. of talcum powder daily, at Anchor Cap & Closure Co., Long Island City, N. Y.

THE KIRK & BLUM MANUFACTURING CO.

Specialists in the Design, Manufacture and Installation of Blower Systems and Industrial Ovens

Plating and Pickling Tanks, Baskets and Acid-Fume Removal Systems
Contract Manufacturers in All Sheet Metals and Light Structural
Stainless Steel Fabrication

2885 Spring Grove Avenue, CINCINNATI, OHIO

DETROIT FACTORY AND OFFICE: 4718 Burlingame Street

CHICAGO OFFICE: 407 South Dearborn Street

REPRESENTATIVES

PITTSBURGH, PA., Bushnell Machinery Co., 1501 Grant Building

LOUISVILLE, KY., Liberty Blow Pipe Co., Inc., 325 Roland Street

KIRK & BLUM



Products

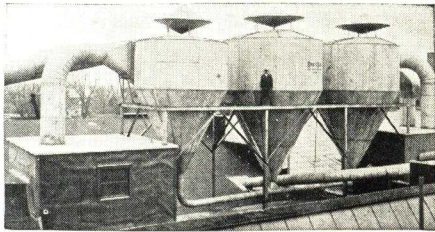
DUST and SHAVINGS REMOVAL SYSTEMS
PAINT SPRAY, FUME and HEAT REMOVAL SYSTEMS
VENTILATING and AIR CONDITIONING SYSTEMS
COOLING, DRYING and HEAT RECLAMATION SYSTEMS for Glass Ceramic Plants
"CYCLONE" DUST COLLECTORS
INDUSTRIAL OVENS for Drying, Baking, Enameling and Lacquering
PICKLING BASKETS, CRATES, LEAD and RUBBER-LINED TANKS; ACID-FUME EXHAUST SYSTEMS.
OTHER PRODUCTS: One-piece Elbows; Blast Gates; Pressed and Rolled Steel Flanges; Belt and Machine Guards; Tote Boxes; Steel Tables; all kinds of Metal Stampings, etc.

Engineering Service

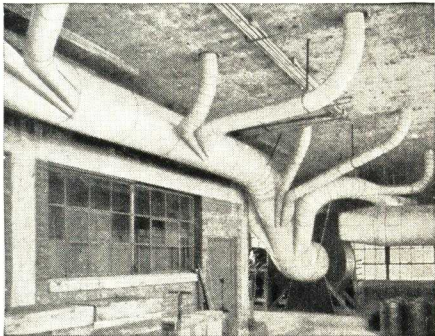
K & B Engineering Service—backed by years of experience in designing and installing K & B Equipment for many of the industrial leaders of the United States, Canada and South America—is at the disposal of architects, contractors, plant engineers and owners.

This service—assuring a definite solution to any problem requiring K & B Equipment—includes: A thorough analysis of the requirements of the job; designing the equipment; submitting a proposal, together with complete specifications and a written performance guarantee; installation by experienced, highly efficient erectors.

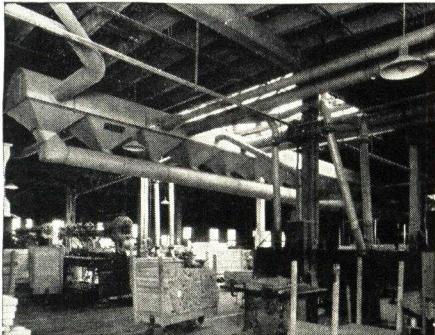
Complete information and valuable data available on request.



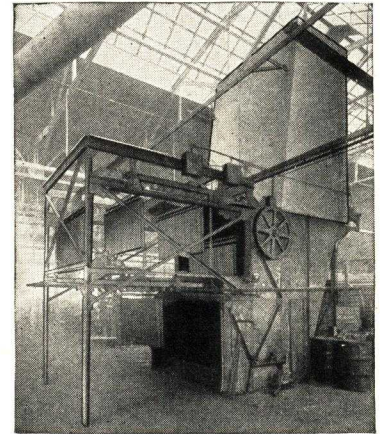
These giant "cyclones" collect all dust from the polishing and buffing departments of the Maytag Company plant, Newton, Iowa



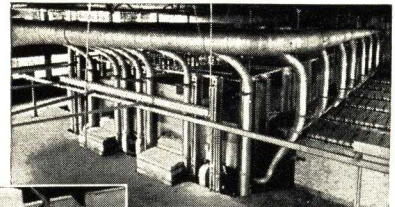
K & B Dust Collecting System at Trico Products Corp., Buffalo, N. Y. Note the streamline fittings—one of the K & B exclusive advantages



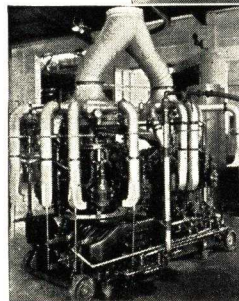
K & B Plenum System at the Mengel Company Plant, Louisville, Ky.



K & B Continuous Conveyor Enameling Oven at the Gemmer Manufacturing Co., Detroit. K & B Ovens—from the smallest box type to large conveyor ovens—assure utmost speed, economy and efficiency in every finishing operation



Above: K & B improved Glass Tank Cooling System. Streamline fittings and long radius one-piece elbows assure greater air pressure with less power



Left: A K & B scientifically designed cooling system on the new No. 10 Lynch Bottle Machine

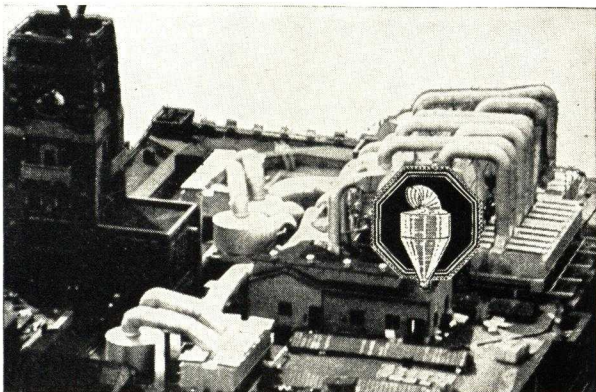
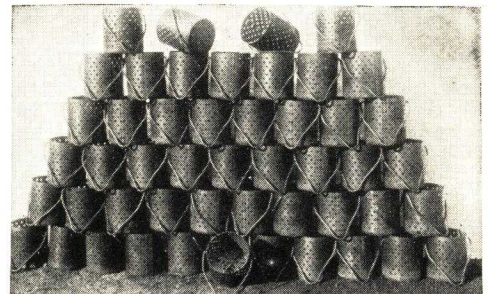


Illustration at left shows Dust Collecting Pipes, Cyclone Collectors and Filters—part of the K & B System at RCA-Victor Co., Camden, N. J.



K & B Pickling Baskets and Crates can be made of any metal for any solution. Stock as well as special designs, to meet individual requirements

THE SPENCER TURBINE CO.

Manufacturers of Turbo-Compressors, Central Cleaning Systems,
Portable Vacuum Cleaners

501 New Park Avenue, HARTFORD, CONN.

REPRESENTATIVES IN 50 CITIES

Products

SPENCER CENTRAL VACUUM CLEANING SYSTEM.

SPENCER TURBO-COMPRESSORS.

Also Spencer Orgoblo (organ blowing apparatus), Spencer Swimming Pool Cleaning System and Boiler Cleaning Equipment.

Spencer Central Cleaning Vacuum System

A central exhaustor located in the basement or boiler room, creates vacuum in permanent piping system with outlets conveniently located throughout the building. Special tools clean cement, wood, linoleum, or other floors, walls, etc.

Industrial Uses—The Spencer Central Vacuum Cleaning System is used for cleaning boilers, factory buildings, removing waste materials, reclamation, and finishing operations.

Advantages—Over 10,000 systems in service have demonstrated the following:

Lower cost of cleaning, better cleaning, better air conditions, and lower maintenance costs in painting and redecorating, because all dust as well as dirt is removed. Can be installed in any building—any size—old or new.

References—The finest examples of all kinds of buildings throughout the country are equipped with Spencer systems. Write for list and complete information.



Spencer Portable Cleaner Used in the S. D. Warren Co. Plant, Cumberland Mills, Maine



Spencer Cleaning System in the Jewel Tea Company Plant

Spencer Portable (Heavy Duty) Vacuum Cleaners

As a supplement to the Central Cleaning System, Spencer manufactures a group of portable cleaners developed to approximate as nearly as possible the performance of the central system, for providing efficient cleaning where for structural reasons it is impractical to install the central stationary system.

Sizes—Four different styles are manufactured, namely: the $\frac{3}{4}$ hp. heavy duty unit and the 2, 3 and 5 hp. truck units.

Industrial Uses—The $\frac{3}{4}$ hp. unit is intended for office and general cleaning, the 2 hp. unit for light duty factory cleaning, the 3 hp. outfit for heavy duty cleaning in factories and other buildings where a single operator is employed. Where two operators are needed to clean in the allotted time or where bulky litter requires the use of a 2-in. cleaning handle a 5 hp. outfit is recommended.

Spencer Turbo-Compressors

Spencer Turbo-compressors are designed especially for furnishing large volumes of air at low pressure under absolute control and high efficiency at all loads.

Uses—Used mainly for furnishing air supply for gas and oil fired furnaces and for cupolas. Thousands are serving foundries, forge shops, heat treating furnaces, japan, enamel, ceramic, and core ovens.

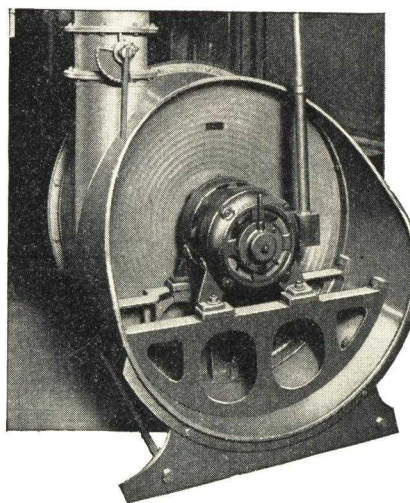
Sizes—75 to 20,000 cu. ft., $\frac{1}{8}$ to 300 hp., 8 oz. to 5 lbs. A new $\frac{1}{2}$ hp. unit is designed especially for individual air supply.

Construction—The Spencer double ribbed wall of rust-and-corrosion-resisting steel plate gives maximum strength with minimum weight.

Operating Features—The advantages of Turbo-Compressors over positive pump apparatus have long been recognized, and the Spencer Turbo-Compressor eliminates the objection raised against them in the larger sizes due to the high speed heretofore regarded as necessary characteristics of turbine apparatus (usually 3500 r.p.m.) by operating at 1750 r.p.m. on $7\frac{1}{2}$ hp. and larger units.

While the 5 hp. and smaller Spencer machines run at 3500 r.p.m., they are designed with several stages so that the impellers do not have any higher peripheral speed than the larger 1750 r.p.m. outfits.

Spencer Turbo-compressors produce a practically constant pressure from no load to full load. If the volume of air in use is reduced the pressure will not run up. If full volume is suddenly required the pressure will not fall. Pulsations are entirely eliminated.



10 Hp. Spencer Turbo-compressor

UNITED CONVEYOR CORPORATION

Pneumatic, Steam Jet and Hydraulic Conveying Systems

1294 Old Colony Building, CHICAGO, ILL.

REPRESENTATIVES IN PRINCIPAL CITIES IN THE UNITED STATES AND CANADA

Exclusive Owners of the Patents and Manufacturing Rights of All Ash Conveyor Equipment Formerly Sold by:
 CONVEYORS CORPORATION OF AMERICA AMERICAN STEAM CONVEYOR CORPORATION GREEN ENGINEERING CO.
 GRIFFIN ENGINEERING CO. GIRTANNER-DAVIES CO.

"United" Nuveyor—Heavy Duty Ash and Soot Conveyor

For Complete Cleanliness—The NUVEYOR offers a heavy duty conveyor system in which ash and soot are conveyed from every point of accumulation to any point of disposal by air alone through an enclosed pipe system. The special design of this enclosed system gives thoroughly dustless operation. Its cleanliness is most noticeable in pulverized fuel plants where the NUVEYOR handles the dustiest kind of ash and fly ash—as well as clinkers. Its power, labor, and maintenance requirements meet the present-day need for lowest possible cost. It is controlled by push button switches from each feeding point. Clean conditions are given by "United" Dustless Unloading Equipment at the ash storage tank.

Capacities are 6 to 30 tons per hour, handling the finest dust to the heaviest sidewall clinkers through conveyor lines up to around 800 ft. long. Ash intakes with 24x24-in. grid hoppers are located *inside* of the ash pit or furnace. The NUVEYOR is operated by a motor driven mechanical Exhauster, or by a Venturi type of Multi-Steam Jet Exhauster. In the latter case, no steam whatsoever comes in any contact with the ash.

"United" Steamatic—Pneumatic Ash Conveyor

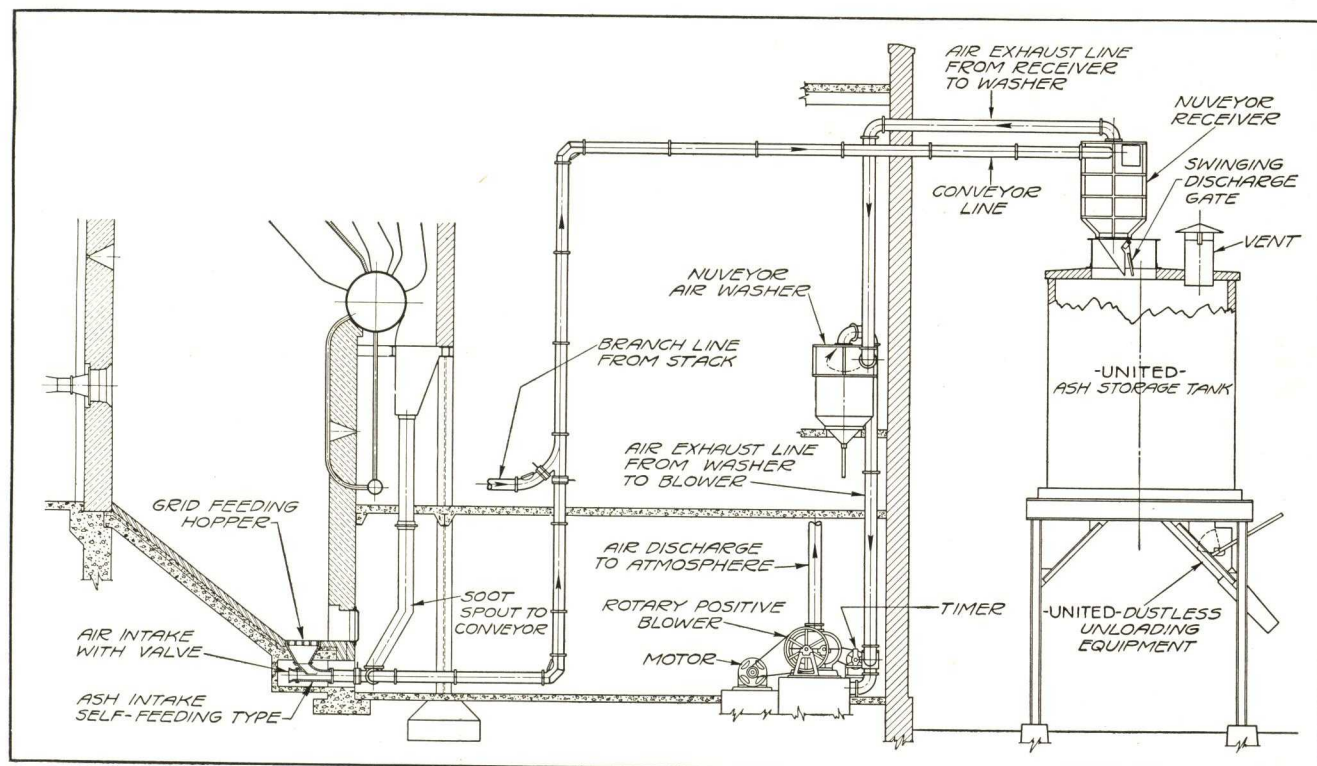
For Moderate Duty—The STEAMATIC Ash and Soot Conveyor employs basic features that are found in the NUVEYOR when operated by a steam Exhauster, but is designed for less severe requirements. Like the NUVEYOR, the STEAMATIC System conveys the ash from all points of accumulation to any point of discharge through a closed pipe system, assuring cleanliness from end to end.

"United" Pneumatic Conveyors

For light and heavy powders and granular materials in commercially dry condition, such as malt, grain, seeds, dusts, soda ash, lime, steel turnings, crushed ores, sugar, coal, coke, ashes, sand, etc. Dustless in operation with no loss of material. Capacities 2 to 100 tons per hour, over distances up to 2000 ft.

Other United Products

"United" and "American" Steam Jet Ash Conveyors.
 Hydroveyor—Ash Sluicing Conveyor Systems.
 Cast Iron Ash Storage Tanks.
 Vitrified Glazed Tile Ash Storage Tanks.
 Air-tight Ash Pit Doors.
 Dustless Unloaders (for dry ash and dust).



Nuveyor Ash and Soot Conveyor Operated by Motor Driven Mechanical Exhauster

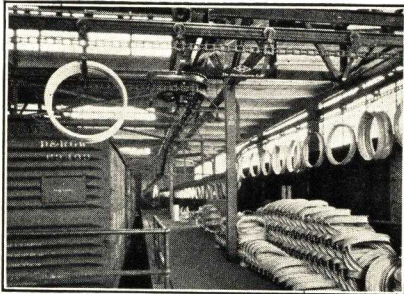
THE ALVEY-FERGUSON COMPANY, INC.

Manufacturers of Material Handling Equipment and Conveyors of All Types
CINCINNATI, OHIO

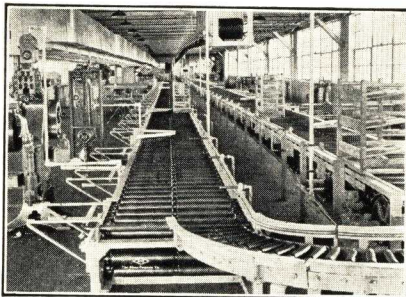
BRANCH OFFICES

NEW YORK, N. Y., 1440 Broadway
CLEVELAND, OHIO, 1836 Euclid Avenue
DETROIT, MICH., 505 Hofmann Building
CHICAGO, ILL., Burnham Building

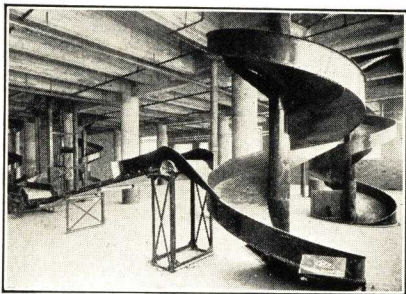
BOSTON, MASS., 10 High Street
PHILADELPHIA, PA., 36th and Walnut Streets
PITTSBURGH, PA., 335 Fifth Avenue
LOS ANGELES, CAL., 783 East 17th Street
SYRACUSE, N. Y., 412 Robineau Road



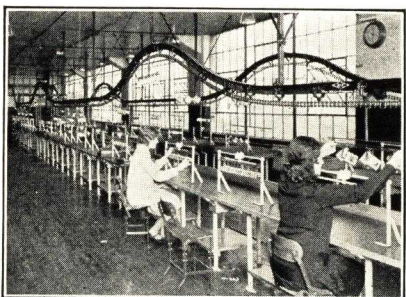
Trolley Conveyor



Production Assembly System



Spiral Chutes and Belt Conveyors



Light Trolley Conveyor



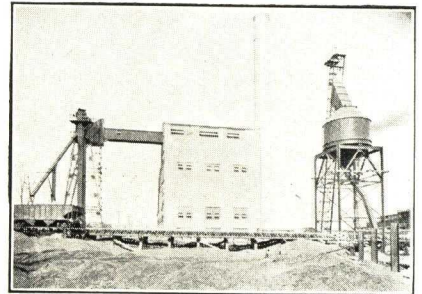
Products

POWER CONVEYORS.
GRAVITY CONVEYOR.
TROLLEY and OVERHEAD CONVEYORS.
OVEN CONVEYORS.
COAL and ASH CONVEYORS.
PORTABLE CONVEYORS.
CARROUSELS.
APRON, BELT, SCRAPER CONVEYORS.
VERTICAL ELEVATORS, SPIRAL CONVEYORS.
SPIRAL CHUTE GRAVITY CONVEYORS.
COMPLETE BULK and PACKAGE CONVEYOR SYSTEMS.

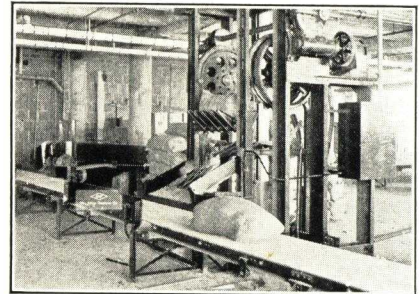
Engineering Service

A complete Engineering Department in charge of experienced and capable conveyor and material handling engineers is at the disposal of engineers, architects, contractors and plant owners. Plans are made without obligation and suggestions with estimates freely furnished on complete conveying systems for any factory, warehouse, pier, dock, or industrial plant.

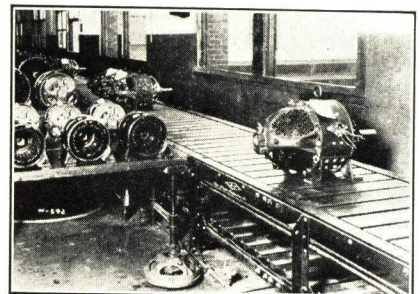
Write the nearest branch or direct to the Home Office, Cincinnati, Ohio.



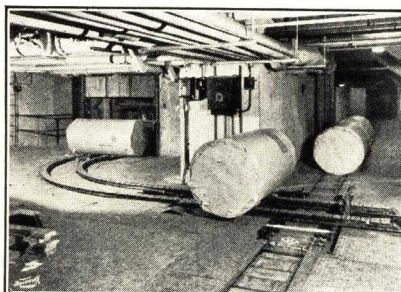
Coal and Ash Handling System



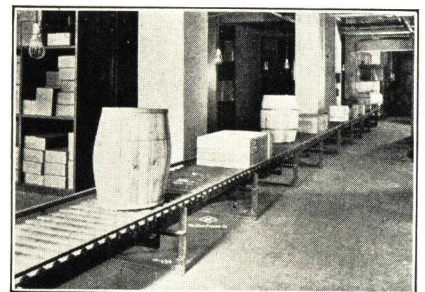
Vertical Elevator and Belt Conveyor



Apron Conveyors



Apron and Transfer Conveyors



Live Roller Conveyors

THE C. O. BARTLETT & SNOW CO.

Material Handling and Processing Machinery

6212 Harvard Avenue, CLEVELAND, OHIO

NEW YORK, N. Y.
30 Church Street

PHILADELPHIA, PA.
Schaff Building

BRANCH OFFICES

PITTSBURGH, PA.
Bessemer Building

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First National Bank Building

AGENTS

BIRMINGHAM, ALA., Keiser-Geismer Engineering Co., Crawford Building

ST. PAUL, MINN., Alan G. Cary & Co., Endicott Building

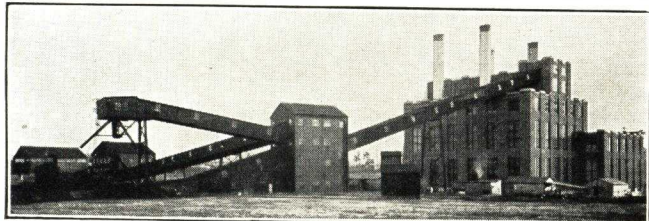
CINCINNATI, OHIO, Oliver S. Kelly, Union Central Building

CANADA: Peacock Brothers, Ltd., MONTREAL, SYDNEY, WINNIPEG, TORONTO, VANCOUVER, and CALGARY

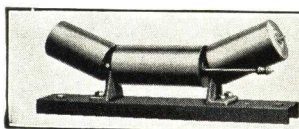
Products

CONVEYORS and ELEVATORS of all types; SKIP HOISTS; DRYERS; CRUSHERS; COAL, COKE and ASH HANDLING EQUIPMENT.

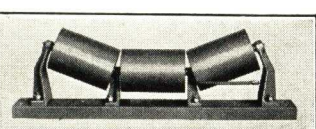
Also Screens; Grizzlies; Car Hauls; Special Cars; Weigh Larries; Hoisting Engines; Feeders; Refuse Disposal Plants; Oil and Grease Extraction Plants; Paint Making Machinery.



Belt Conveyors Carrying Coal to Large Power Plant
Capacity 800 tons per hour



Series 10 Belt Conveyor Idler



Series 40 Belt Conveyor Idler

Conveying and Elevating Machinery

Built to operate perfectly regardless of service conditions Bartlett and Snow conveyors and elevators are of rugged construction. Each installation is skillfully engineered for the particular conditions to be met and furnished with guarantees of performance. Standard sizes include the following:

Belt Conveyors—Flat or troughed; widths 16 to 72 in.; two, three, or five-pulley types.

Steel Apron Conveyors—Five standard types; capacities 30 to 640 tons per hour. For lump or granular material.

Wood Apron Conveyors—Widths from 10 to 48 in. for carrying boxes, bags, packages and for continuous assembly.

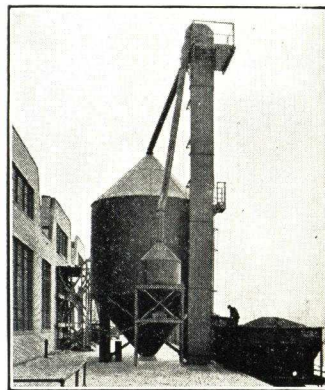
Flight Conveyors—Six standard types; capacity 410 to 11,800 cu. ft. per hour. For carrying material at angles up to 30°.

Screw Conveyors—Sizes 4 to 18-in. diameter. Capacities 1 to 95 tons per hour. For grain, cement, fine coal, etc.

Bucket Elevators—Capacities 26 to 126 tons per hour. Buckets carried on belt or chain. For handling coal, rock, sand, etc.

Centrifugal Discharge Elevators—Seven standard sizes. Capacities 2 to 125 tons per hour. For elevating loose material when lumps do not exceed 3 1/4 in. in size.

Special Equipment for Capacities up to 2000 tons per hour.



Bucket Elevators

Skip Hoists

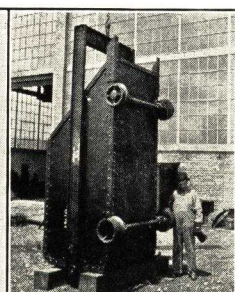
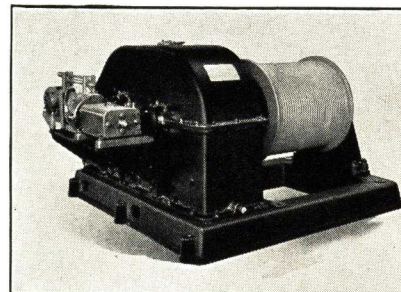
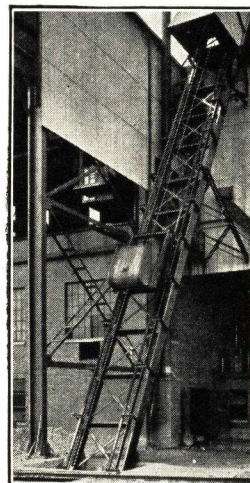
Furnished in semi-automatic and fully automatic types for all conditions.

Semi-automatic Type completes a single cycle, bucket rises, dumps, returns and comes to rest in position, ready for reloading.

Fully Automatic Type operates continuously without manual control, as long as there is material to handle.

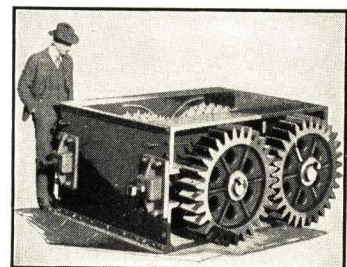
Skip Hoists find greatest use in handling hot, abrasive or large material where the lift is high or the tonnage large.

Rugged construction and low maintenance costs make Bartlett and Snow Skip Hoists unequalled for lifting coal, coke, ashes, ores and similar materials.



Crushers

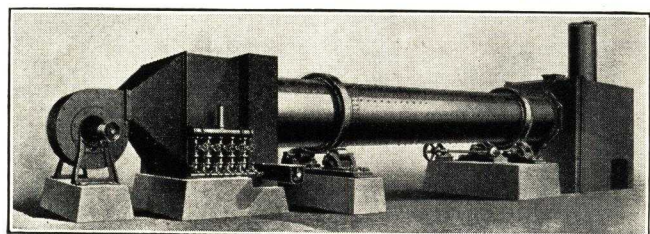
Single roll, two roll and four roll types for coal, with replaceable segments which permit the renewal of the crushing surface without installing new rolls. Capacity 25 to 750 tons per hour. Also Cycle Crusher Pulverizers of the standard swinging hammer type for reducing limestone, shale, slate, bakelite, zinc ores and similar materials to between 10 and 40 mesh. Capacities from 1 to 25 tons per hour. Write for Bulletin 53. Free on request.



Dryers

Thirteen distinct types of mechanical dryers, each of which has a particular field of application, provides a standard type of dryer peculiarly fitted for your every requirement.

Bulletin No. 51 describes all types. Free on request.



Style J Dryer

CHAIN BELT COMPANY

ALSO OWNING AND OPERATING THE STEARNS CONVEYOR CO., OF CLEVELAND, OHIO

HOME OFFICE AND WISCONSIN DISTRICT OFFICE

1642 West Bruce Street, MILWAUKEE, WIS.

BRANCH OFFICES

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BUFFALO, N. Y., 85 High Park Blvd.

CHICAGO, ILL., 20 No. Wacker Drive

CINCINNATI, OHIO, 2108 Central Parkway

SYRACUSE, N. Y., 406 Franklin St.

CLEVELAND, OHIO, Western Reserve Bldg., Room 206, W. 9th and Superior Ave.

DETROIT, MICH., 2842 West Grand Blvd.

INDIANAPOLIS, IND., 542 No. Meridian St.

KANSAS CITY, MO., 916 Wyandotte St.

LOS ANGELES, CALIF., 1414 Santa Fe Ave.

MINNEAPOLIS, MINN., 808 LaSalle Ave.

NEW YORK, N. Y., Chrysler Bldg., Room 529
PITTSBURGH, PA., 706 Magee Bldg.

PORTLAND, ORE., 67 First St.

SAN FRANCISCO, CALIF., 909 Harrison St.

SEATTLE, WASH., 1212 6th Ave., So.

ST. LOUIS, MO., Avalon Hotel, 339 No. Taylor Ave.

LONDON, ENGLAND, W. C. 2

Products

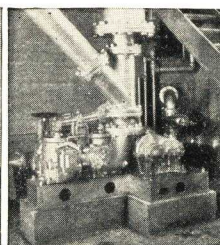
REX CONVEYING SYSTEMS, ELEVATORS and CONVEYORS for handling all types of bulk materials, work in process and package goods: Rex Pivoted Bucket Carriers, Rex-Stearns Belt Conveyors, Rex Coal and Ash Handling Systems, Rex Bulk Handling Systems, Rex Package Handling Systems, Rex Overhead Conveying Systems, Rex Foundry Sand Handling Systems, Rex Progressive Assembly Conveyors, Rex Elevators of all types, Rex Pan Conveyors and Apron Feeders, Rex Scraper Flight Conveyors, Rex Chains and Transmission Machinery, Rex Roller Chain, Rex Stripping Conveyors, Rex Sanitation Equipment, and Rex Z-Metal Chains.

REX TRAVELING WATER SCREENS.

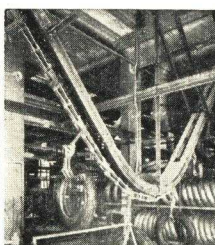
Also, Rex Land-saver Storage Systems, Rex Concrete Mixers and Pavers, Rex Plaster and Mortar Mixers, Rex Pumps, Rex Saw Rigs and Rex Moto-mixers. Rex Cold Patch Mixers and the Rex Pumpcrete (the pump that pumps concrete).



BUCKET ELEVATORS



SLUDGE PUMPS



OVERHEAD CONVEYORS

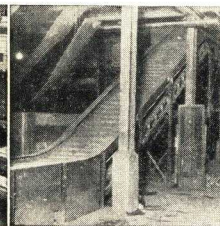
The Rex 330 and 440 Catalogues and Engineering Data Books

The Rex 330 Catalogue covers the subjects of Chain, Conveying and Power Transmission Equipment. It covers all phases—chain, belt conveyors, traveling water screens, foundry equipment, etc. It consists of 816 pages, exhaustively indexed for quick use.

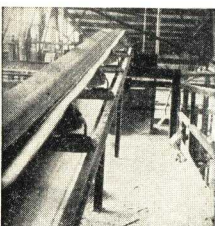
The Rex 440 Catalogue, a catalogue and engineering data book, is devoted to the treatment of Roller Chains and Sprockets, containing prices, weights and information on the application of Rex Roller Chains, Rex Block Chains, Rex Leaf Chains and Rex cut tooth sprockets. Both treatises will be sent free to persons in firms using or specifying equipment as mentioned above.



PROGRESSIVE ASSEMBLY



APRON CONVEYORS

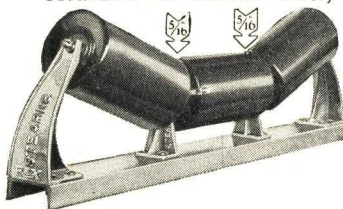


BELT CONVEYORS

Rex-Stearns Belt Conveyor

Available in carrier units, standardized conveyor units, and complete belt conveying installations. One-piece pulley shell construction, independently mounted, Timken bearing equipped, long-time lubrication. Made in four types: chilled face cast iron, tubular steel, gray cast iron and rubber covered. Every kind

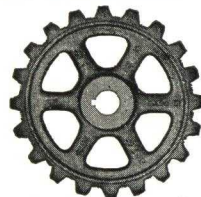
of service found in belt conveying is provided for in this complete line of antifriction idlers. Write for complete information.



(Reg. U. S. Pat. Off.)

Rex Sprockets, Buckets, Set-Collars

Have teeth and rim hardened to make a tougher and longer wearing surface. For chain from $\frac{3}{8}$ to 30-in. pitch. Buckets for all services



and set-collars and take-ups.

Rex Drive and Conveying Chains

Of all types, steel, malleable, and combination, for conveying, power transmission, and duplicate machinery services. Also Detachable, Pintle H Type, Ley Bushed, and other types.



Rex Drive Chain with Hidden Shoulders

Working loads 100 to 4500 lb.



Rex Chabelco All-steel Roller Chain

Working loads 150 to 10,000 lb.



Rex Durobar with Relieved Barrel

Working loads 500 to 8400 lb.



Rex Unicast One-piece Link Roller Chain

Working loads 150 to 5500 lb.

Rex Traveling Water Screen

Now in general use for screening out debris and animal matter in advance filtration and power plant intakes. Built to meet all specifications.

Rex Roller Chain

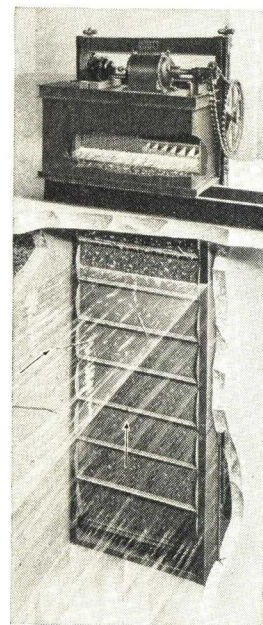
A complete line of roller chain in all standard sizes from $\frac{3}{8}$ in. to 2 $\frac{1}{2}$ in., of a high degree of finish, accuracy and uniformity.



Rex Z-Metal Chains

A new series of cast chains, by the CHAIN BELT COMPANY, is produced of Rex Z-Metal. Rex Z-Metal is harder and stronger than usual or normal cast or forged steels. This remarkable metal is ideal for use in chain, providing great strength—hardness—long wear—and peculiarly great resistance to many kinds of corrosion from acids and other chemicals.

The important advantage of Rex Z-Metal Chain is the opportunity offered to users of cast chains to increase the life of any installation without making expensive changes in the style and size of chains and sprockets already in use.



Rex Traveling Water Screen

LOWERATOR MANUFACTURING COMPANY

Material Handling Equipment—Standard and Special Units
Engineered, Designed and Built in Brooklyn

Lowerator Building, York and Pearl Streets, BROOKLYN, N. Y.

Lowerator Products, Service and Facilities

PUSHER BAR ELEVATORS; ELECTRIC DUMBWAITERS; AUTOMATIC OVERLOAD for electric dumbwaiters, belt and chain drives. Also Gravity Roller Conveyors and Accessories, Belt Conveyors, Pallet and Slat Conveyors, etc.

LOWERATOR products and service are backed by 26 years of continuous progress which has kept both abreast of the modern demand for *speed*. Changing conditions frequently necessitate the re-adjustment or replacement of existing handling and manufacturing equipment and manufacturing methods. For such problems and wherever an efficient, economical conveying system is required, our Engineering Department is available for analysis and co-operation in the selection of the most suitable equipment.

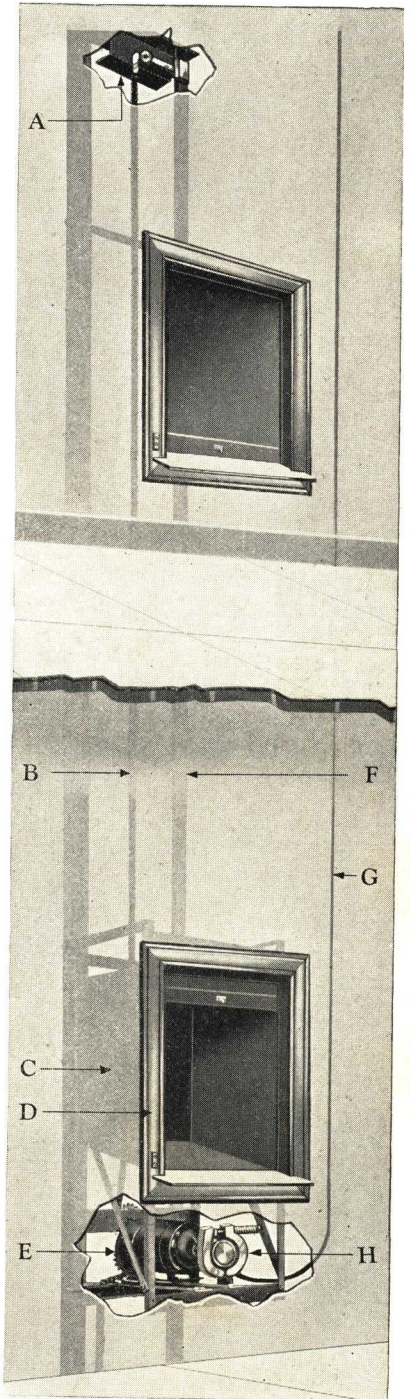
The Lectorwaytor

(Patent Applied For)

An improved electric dumbwaiter that fulfills every requirement of reliability and sturdiness. It is extremely simple in design and construction, being composed of only *two* essential units—the *guides* and the *car*.

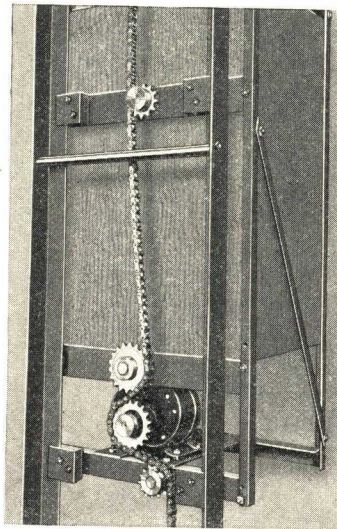
The driving mechanism—the *motor, brake and reducing gears*—are mounted on the *car chassis* and the entire unit is factory-assembled and shipped ready for installation.

Two guide rails of any specified length are furnished ready to be bolted in place. A single strand of hardened steel roller chain is anchored at the top and bottom of the guides. In operation, the car climbs up and down this chain, being stopped automatically at any desired level by a limit switch.



A Floor-to-Floor Lectorwaytor Installation
(Patent Applied For)

- A. Patented Overload Protector
- B. Hardened Steel Roller Chain
- C. Car—furnished in any desired sheet metal—monel, stainless steel, etc.
- E. Motor and Reducing Gears
- F. Guide Rails
- G. Power Supply Cable
- H. Electric Brake

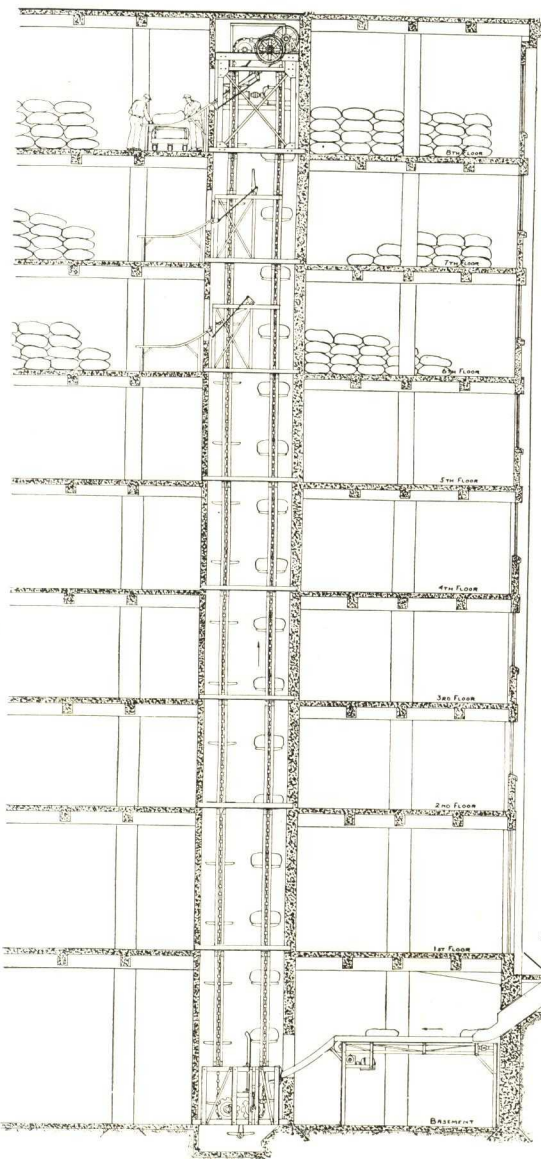


The Lectorwaytor
(Patent Applied For)

Note that the car and driving mechanism are all contained in *one compact unit*

Saves Space—No extra space at the top or bottom of the shaft is required for the motor and driving mechanism, no offset in the shaft enclosure—just a straight shaft a few inches larger than the car dimensions. The Lectorwaytor can be quickly and economically installed in existing dumbwaiter shafts.

Patented Overload Protector—This unique safety device is mounted at the suspension point of the chain. Should the car be overloaded the circuit is broken—when the overload is removed the circuit is automatically re-established. This automatic action functions in either direction of travel. The Lectorwaytor is furnished for full floor-to-floor or undercounter service. Further information on request.



Typical Bag Elevator Installed by Us in One of the Largest Coffee Roasting Plants in the World

From street through basement to the 8th floor with but *one* handling. Bags of green coffee, weighing 150 lbs. each, are elevated at the rate of fourteen per minute providing a capacity of over one million pounds per eight-hour day. Thus a constant supply to the roasters is assured

GIFFORD-WOOD CO.

OPERATING C. W. HUNT CO. DIVISION

Manufacturers of Screening, Elevating and Conveying Machinery,
Coal and Ice Handling Equipment and Tools

21 Hill Street, HUDSON, N. Y.

NEW YORK, N. Y., 420 Lexington Avenue

CHICAGO, ILL., 565 West Washington Street

Two years after the War of 1812 Elihu Gifford started his "Air Furnace" at Hudson, New York. It was a foundry. The town had been settled by whalers from New Bedford, and the processes of rendering whale oil required primitive machinery which Gifford supplied. The original foundry still stands. But, today, 119 years later, a modern plant with 6 large, well-equipped shops, having unequalled shipping facilities, stands at Hudson, manufacturing elevating and conveying machinery for all types of materials, vibrating screens, marine engines and numerous unit machines. It is managed by direct descendants of its founder.

G-W Products

MATERIAL HANDLING EQUIPMENT—

Systems designed and built complete, or in unit form, f.o.b. factory. It includes: chain and bucket elevators, trolley bucket conveyors, tray elevators, platform, incline, belt and chain conveyors, lowering machines.

The equipment will handle: boxes, bales, bags, sand, gravel, ashes, coal, coke, stone, foundry sand and many other materials. Bulletins are available covering these varied uses.

POWER PLANT EQUIPMENT—

Pivoted bucket carriers, bucket elevators and conveyors, skip hoists, weigh laries, flight conveyors, hoppers, gates and chutes. Bulletins are available for these products.

RETAIL DEALER COAL HANDLING EQUIPMENT—

Complete plants, or individual units of equipment. Two types: Chain and bucket elevators, or trolley bucket elevators. Unit elevators are also produced, which are shipped f.o.b. factory. Bulletins are available.

ICE HANDLING MACHINERY and ICE TOOLS—

We make equipment to handle ice under every possible condition, from the time it is made to the time it is placed in the refrigerator. We also have ice-cubers, crushers, waterproofed cartons, and quality ice tools.

Bulletin mailed on request.

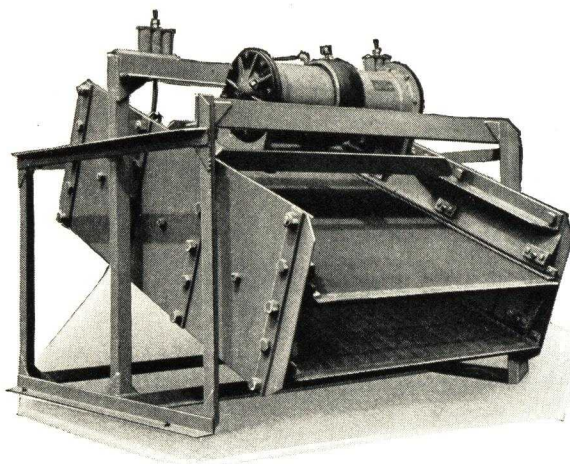
MITCHELL ELECTRIC VIBRATING SCREENS—

Bulletin on description and performance mailed on request.

The Barrel Elevator

Breweries, now that beer is back, will find an elevator of this type especially desirable, particularly where the property is long on height but short on area. The elevator can be made to any height and is just as good at bringing barrels down as it is taking them up. Full or empty. Prices are available and we will be glad to quote.

Mitchell Electric Vibrating Screen



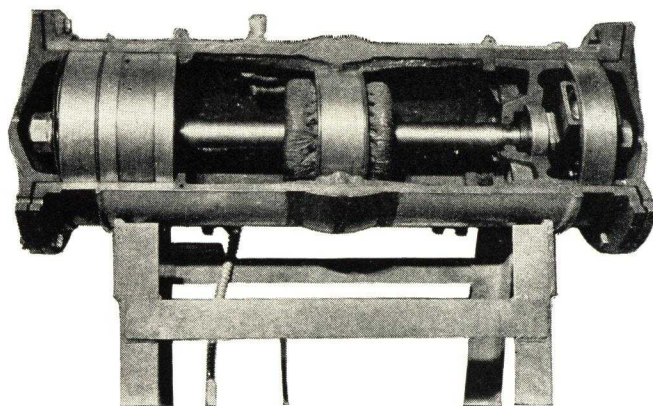
A Double-deck Mitchell Screen. Note Welded Construction

We believe this screen will outperform screens of similar capacity under equal conditions. We believe this because seeing is believing, and, checked by the customer's engineers, we have been enabled to compile an extremely impressive performance report of its work in one of the largest cement mills in the East. A copy is available upon request.

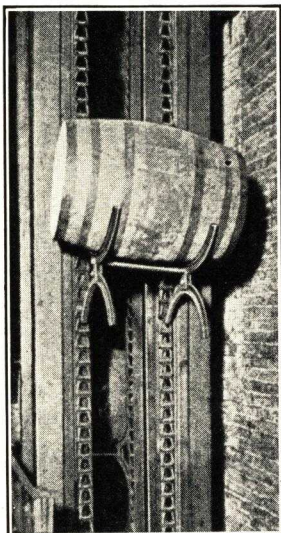
Mitchell Electric Vibrating Screens operate through the effect of unbalanced weight. An electric rotor, rated at 3600 R.P.M. produces that many vibrations per minute, transmitting them through side-plates—divorced from the frame—and so to the screen cloth upon which there is not a square inch of dead space.

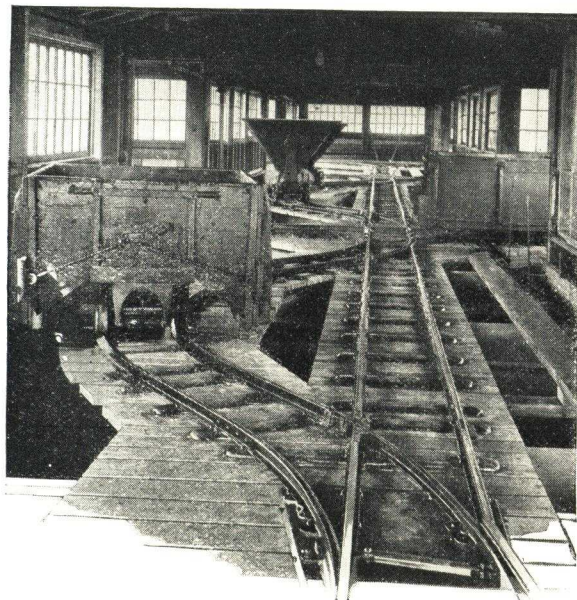
This screen is effective with any screenable material, and our engineers will be glad to give you a close estimate of its capacity (in your terms) if the necessary simple data is supplied.

The picture below shows how the vibrating action is secured. Center is the rotor. Right is a hardened ball race. Within is, in a cage, a 2-in. steel ball. Left is a similar assembly, but with the ball caged opposite the right one. The whole assembly is dust and moisture tight and no trouble has been experienced by burned out electrical connections. Amplitude of vibration, $\frac{1}{8}$ in. Special bulletins may be had. The price is extremely low.



Cut-away View of Dustproof and Moistureproof Vibrator Unit

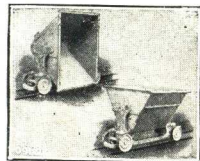




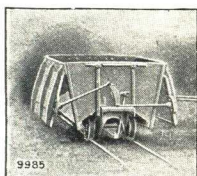
Complete Hunt Industrial Railway System Inter-connecting Four Wilmington Terminal Warehouse Co. Buildings, Wilmington, Del.

The Industrial Railway

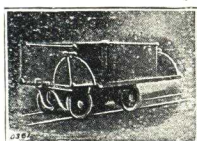
The Hunt Industrial Railway, complete with tracks, cross-overs, switches and cars, has been long and favorably known for the economy it permits within plant areas. At the top is a typical installation. To the left are three of the many different types of cars made for it.



Standard Tip Car



Standard Four-wheel Self-Dumping Push Car



Standard Charging Car

Tracks may be laid on any form of floor or roadbed, and can be run across or between standard railroad rails without cutting the rail heads. Made up in 20-ft. sections, with ties spaced every 24½ ins. Track gauge is 21½ ins. Combinations of switches are left or right hand, 2-way or 3-way, with or without stands.

Cars are furnished to customers' specifications, and may be had in a variety of styles, aside from the standards, three of which are shown. Standard width for clearance is 4 ft. Curve radius, 12 ft. Literature available.

Motive Power—Electric engines, gas-line propelled engines, capstans, or man-power may be used. Storage battery engines have been popular, as well. There is no necessity for skilled labor being used in the assembly of this system. Common labor is usually used. The advantages of such a system are commonly known, but if the reader has a peculiar local problem, our engineers will be glad to assist in its solution.

Low Body Duplex Valve

The valve as shown is especially adapted to ash hoppers. It has outside flanges, and its installation is no puzzle. The valve

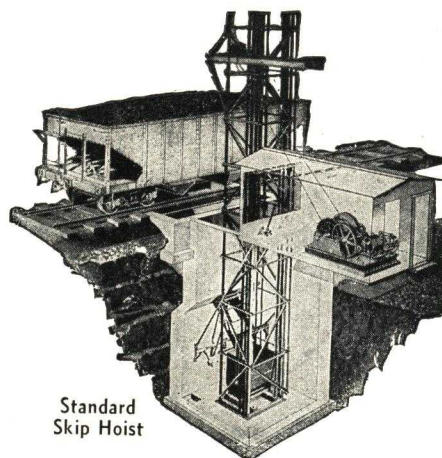


Low Body Duplex Valve

is heavily built and is not quickly burned out, which is one reason for its widespread use. A number of other designs are available.

Hunt Skip Hoist

The Hunt Skip Hoist is made in capacities from 25 tons to 300 tons per hour. It may be had push button (manually operated) style, or full electric automatic.

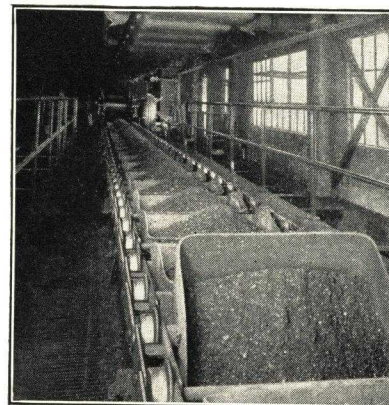


Standard Skip Hoist

The single bucket skip is counter-weighted and the guides carefully designed to take care of both bucket and counter-weight. We also make electric skips with drum type controller, and steam hoist, friction operated skips, if such are desired. We have installed them vertically and on inclines; they work efficiently either way. Data on request.

Hunt Pivoted Bucket Carrier

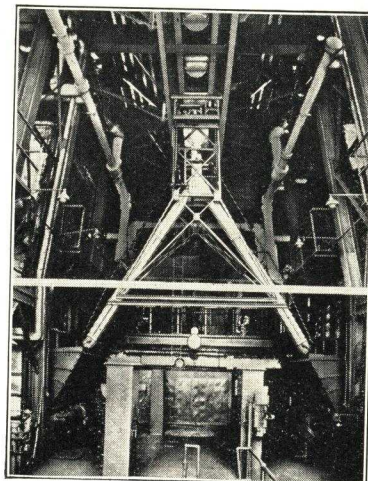
This system, for coal or ashes generally, consists of buckets which swing freely so they can dump in either front or back direction. The conveyors can run in either direction, also, with the buckets hanging in upright position. The special advantage is that dry or wet material can thus be handled. The list of installations is impressive. Data is available.



Hunt Pivoted Bucket Conveyor at Bush Terminal, Brooklyn, N. Y.

Gates and Weigh Larries

The illustration shows an installation of Hunt gates and a Hunt Weigh Larry at Bush Terminal in Brooklyn, New York. The Hunt line in handling equipment has no better representative than these two pieces of equipment. The weigh larries have been standard for years, and the gates are widely popular because of their durability and long life. We appreciate every plant has its own peculiar problems, and will be glad to apply our specialized knowledge of the products, to the use you want to put them to.



Installation of Hunt Gates and Weigh Larry at Bush Terminal, Brooklyn, N. Y.

PORTABLE MACHINERY COMPANY

DIVISION OF A. B. FARQUHAR CO., LIMITED

YORK, PA.

BRANCH FACTORIES AT

CHICAGO, ILL., 4444 Elston Avenue

CLIFTON, N. J.

Manufactured in Canada by Dodge Manufacturing Co., Ltd.

Products

PORTABLE and STATIONARY CONVEYORS for handling all kinds of loose and bulk materials.



Fig. 1

The Ace (Fig. 1)

Most efficient type for handling coal of all sizes, coke, ashes and similar materials. Equipped with *Iron Clad Belt*. Extremely portable. Discharge adjustable on 25-ft. length, 7 to 14 ft. Belt width 14 or 18 ins. Lengths up to 40 ft. Capacity of 14-in. width 90 tons per hour.

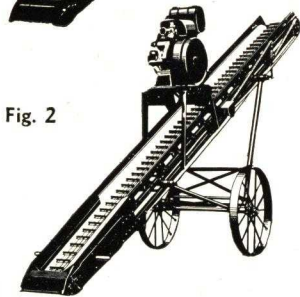


Fig. 2

The Trough (Fig. 2)

Recommended for handling sharp and abrasive materials. Best type for general utility. Adjustable on 25-ft. length, 7 to 14 ft. Belt widths 14, 18 or 24 ins. Lengths up to 60 ft. Capacity of 18-in. width 50 yds. per hour.



Fig. 3

The Drag (Fig. 3)

Used principally for handling large lump coal where a steep angle of elevation is required. Most portable heavy duty "scraper" type conveyor obtainable. Width of trough 20 ins. Standard lengths 20, 25 and 30 ft. Special lengths to order. Capacity 60 tons per hour.

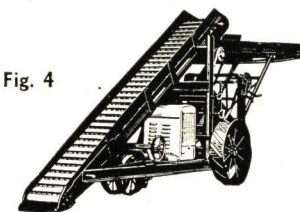


Fig. 4

The Power Propelled (Fig. 4)

Furnished with either *Iron Clad Belt* Conveyor units or Drag Conveyor unit. Has independent drives permitting movement in all directions while conveyor is operating or idle. Can be swung in short radius. Used principally for large capacity operations.

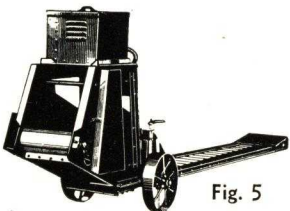


Fig. 5

Under-Car-Unloader (Fig. 5)

Speeds up car unloading and eliminates labor of shoveling. Handles all kinds of loose materials, slides across rails, giving ample clearance to allow hopper door to swing wide open. Equipped with *Iron Clad Belt*. Alemite lubrication. Weight only 1100 lbs.

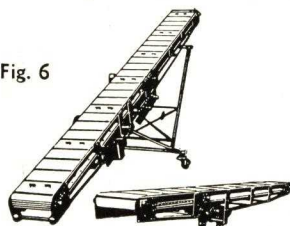


Fig. 6

The Freight (Fig. 6)

Standard units for stacking bags, boxes, bales, etc., for horizontal conveying or carrying from one floor to another. Equipped with wheels for outside use or with casters for use on smooth floors. Special adaptations for handling all kinds of commodities under all conditions. (See Figs. 8 and 9.) Widths 14, 18, 24 and 30 ins. Standard lengths 17 and 27 ft. Special lengths and widths to order.

Service

Special Conveyors of all kinds to order. Layouts and quotations furnished without obligation.

Light Weight Sectional (Fig. 7)

For carrying materials horizontally or up a slight incline. Portable self-contained units mounted on wheels or installed permanently. Handles all kinds of loose and bulk materials.



Fig. 7

The Heavy Sectional (Fig. 8)

Recommended for all permanent installations over 100 ft. in length or where heavy duty service is required. Belt 18 or 24 ins. Dust cover over return belt entire length. Alemite lubrication for rollers. Cut tooth sprockets. Heavy service roller chain.

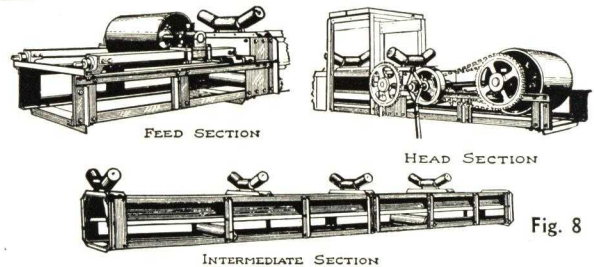


Fig. 8

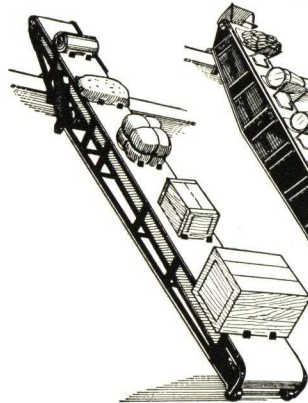


Fig. 9 Hatch "F"

The Hatch "F" (Fig. 9)

For special adaptations. Handles bags, boxes, bales from holds of ships and from floor to floor. Widths and lengths to suit.



Fig. 10 Hatch "B"

The Hatch "B" (Fig. 10)

Recommended where packages are to be handled at steep elevation. Fitted with patented collapsible pocket carriers. Belt 30 ins. wide. Lengths to suit.

The Brick Conveyor (Fig. 11)

Standard size 20 ins. x 45 ft. Adjustments provided to offset rise and fall of tide when handling from barges.

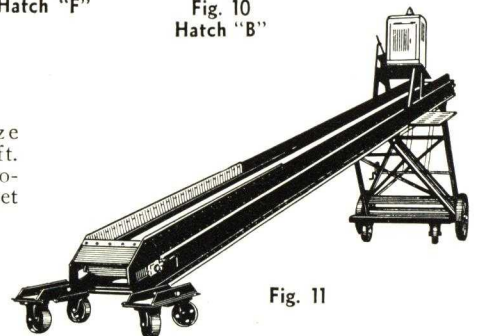


Fig. 11

Bulletins

Complete descriptive folders of any of the above conveyors cheerfully sent on request.

SANDVIK STEEL, INC.

Woolworth Building
NEW YORK, N. Y.

Products

STEEL CONVEYOR BELTING.

Cold Rolled and Hardened and Tempered Strip Steel; Hot Rolled Tool Steels and Solid and Hollow Rock Drill Steel.

Sandvik Steel Conveyor Belts

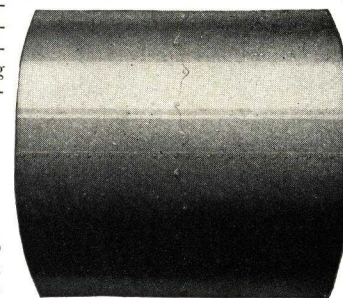
Made of cold rolled, hardened and tempered, high carbon steel in one-piece lengths of 250 to 325 ft. Their flexibility and dense, hard surface provide the elastic and wear-resisting qualities so essential in a conveyor belt.

Joining—Joining of the steel belt is done by means of an ordinary riveted lap joint, with short overlap and countersunk rivets. Where a very smooth joint is desired the heads of the rivets are filed off flush with the belt.

Full instructions and tools are furnished which make this work very simple.



In handling sticky or plastic materials the steel belt is easily kept clean and free from any accumulation or building up of material. Discharge of material at any point is very easily accomplished with Discharge Scrapers, stationary or traveling type, without any appreciable wear on the belt.



Sandvik Steel Conveyor Belt with Longitudinal Joint

Sandvik Steel Conveyor Belts with Longitudinal Joint

Our method of joining two or more belts (patented in all important industrial countries) to secure a width greater than 32 in. can be described as an interlacing of the belt edges. The longitudinal joint is for all practical purposes perfectly tight and as a specially evolved cold riveting process is used, the temper of the steel is not affected. The jointed belt has the same flexibility in both directions as the single belts of which it is composed. Rivets will not loosen and work out.



Handling Wet Clay on Steel Belt Conveyor

SIZES AND WEIGHTS OF SANDVIK STEEL BELTING

Nominal Width, in.	Thickness, U. S. S. G.	Actual dimensions, in.		Weight, lb. per ft.
		Width	Thickness	
10	24	9.84	0.0236	0.85
10	22	9.84	0.0315	1.08
12	24	11.81	0.0236	0.97
12	22	11.81	0.0315	1.28
14	21	13.78	0.0354	1.68
16	21	15.75	0.0354	1.95
18	21	17.72	0.0354	2.19
20	20	19.69	0.0394	2.62
24	20	23.62	0.0394	3.14
28	18	27.56	0.0472	4.40
32	18	31.50	0.0472	5.03

Sizes of belts listed in table are carried in stock at New York, N. Y. Other sizes are available.

SIZES AND WEIGHTS OF SANDVIK STEEL BELTING WITH LONGITUDINAL JOINT

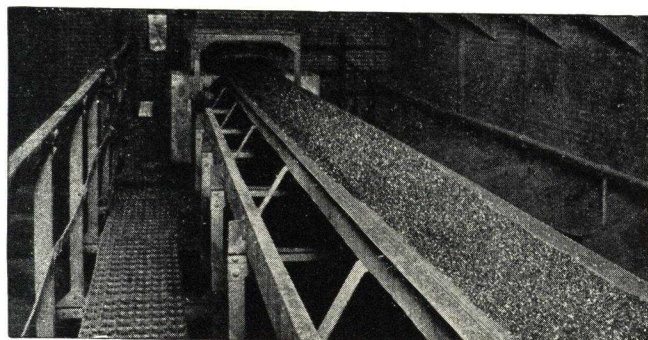
Nominal width, in.	Thickness, U. S. S. G.	Actual dimensions, in.		Weight, lb. per ft.
		Width	Thickness	
34	21	33.46	0.0354	4.38
38	20	37.40	0.0394	5.24
46	20	45.28	0.0394	6.28
54	18	53.15	0.0472	8.71
61	18	61.03	0.0472	10.00

Sizes of belts listed in table are obtained by joining two standard belts. Other sizes are available.

Steel Belt Conveyors

Steel Belt Conveyors are used in a great many industries for handling a wide range of materials—both bulk and packaged.

Advantages—Simple in design, long life, low in first cost and low in maintenance. No belt stretch to be taken care of. Power consumption is low due to the light weight of the belt and its flexibility in bending over terminal pulleys and idlers.



Steel Belt Conveyor Equipped with Traveling Discharge Plow, Distributing Coal to Bunkers

Engineering Service

Each installation presents an individual problem and should have careful engineering study to insure best operation and maximum service from the steel belt. Our experience and services are always at the disposal of those contemplating the installation of conveying equipment. Submit your material handling problems to our engineers. Recommendations and estimates will be prepared without any obligation on your part.

Send for our complete Engineering Catalog No. 30.



Handling Hollow Tile on Steel Belt Conveyor

SPROUT, WALDRON & CO., INC.

Manufacturers of Crushing, Grinding, Mixing, Sifting, Packing, Material Handling and Power Transmission Machinery

22 Waldron Street, MUNCY, PA.

REPRESENTATIVES IN PRINCIPAL CITIES

Skilled
Engineering
Service

MONARCH
TRADE-NAME

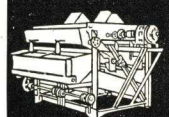
Complete
Manufacturing
Facilities



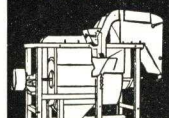
Purifiers



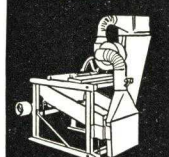
Reels



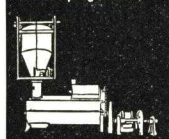
Grain Cleaners



Scourers



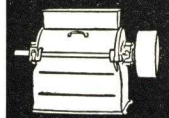
Scalping Shoes



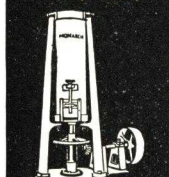
Blending Units



Continuous Mixers



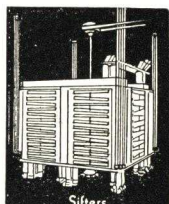
Rotary Cutters



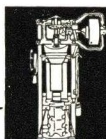
Temperers



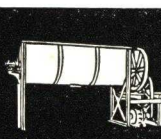
Burr Mills



Sifters



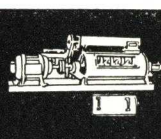
Packers



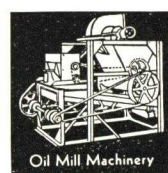
Horizontal Mixers



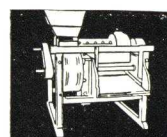
Bucket Elevators



Molasses Mixers



Oil Mill Machinery



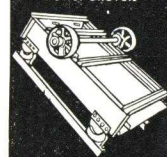
Corn Shellers



Conveyor Idlers



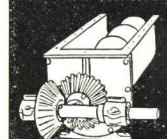
Power Shovels



Vibrating Screens



Sheet Metal Fabrication



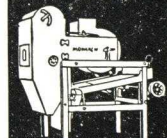
Spiral Conveyors



Magnetic Separators



Aspirators



Peanut Mill Machinery

Products and Services

GRINDING MACHINERY—Roller Mills, Burr Mills, Attrition Mills, Hammer Mills.

CRUSHING MACHINERY—Especially designed for feed and process industries.

MIXING MACHINERY—Batch or Continuous, Vertical or Horizontal, for Powdered or Liquid Products.

SIFTING AND GRADING MACHINERY—Sieve Bolters, Reels, Screen and Air Separators, and Vibrating Screens for handling products of flour fineness to crushed stone.

AUTOMATIC FEEDING MACHINERY—Percentage Feeders for accurately measuring and regulating the flow of free flowing dry products.

KNIFE CUTTERS—Machines for cutting grain, leather, cardboard, etc.

PACKING MACHINERY—Screw and Vibrating Packers for filling bags or barrels.

ELEVATING MACHINERY—Bucket Elevators (wood or steel), chain or belt, open or encased, for all kinds of service; also a full line of turnheads, bin gates, winches, etc.

SPIRAL CONVEYORS—Spiral Conveyors for handling food products, cement, sand, etc., in diameters from 3 to 24 in.

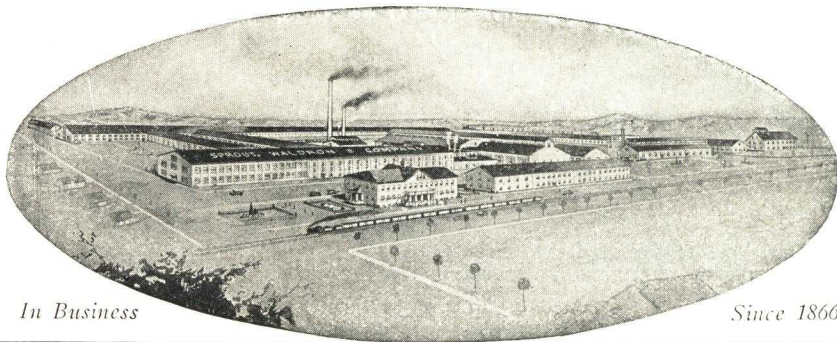
BELT CONVEYORS—A full line of Anti-friction Idlers, Trippers, Take-ups, Head and Boot Pulleys and appliances.

POWER TRANSMISSION—Pulleys, Gears, Sprockets, Chain, V-Belt Sheaves, Take-ups, Hangers, Pillow Blocks, Couplings, Collars.

FABRICATED PLATE WORK—Chutes, Bins, Tanks, Piping and custom work.

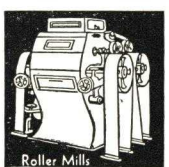
CASTINGS—White iron for cutting, crushing, lining purposes, etc. Also gray castings to order.

Inquiries—We solicit your inquiries and will promptly co-operate in furnishing catalogues, detailed information, and estimates on equipment that interests you.



In Business

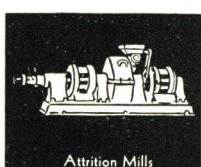
Since 1866



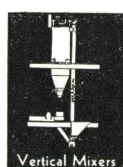
Roller Mills



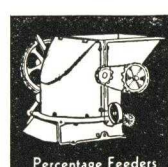
Pulleys



Attrition Mills



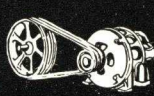
Vertical Mixers



Percentage Feeders



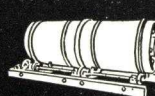
Conveyor Trippers



V-Belt Drives



Dust Collectors



Rice Mill Machinery



Crushers



Sprockets



Vertical Conveyors



Bearings

STEPHENS-ADAMSON MFG. CO.

19 Ridgeway, AURORA, ILL.

PACIFIC FACTORY: LOS ANGELES, CALIFORNIA

CANADIAN FACTORY: BELLEVILLE, ONTARIO

BRANCH ENGINEERING AND SALES OFFICES

NEW YORK, N. Y., 50 Church Street
CHICAGO, ILL., 20 No. Wacker Drive Bldg.
CLEVELAND, OHIO, Hanna Bldg.
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2227 E. 37th Street

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SEATTLE, WASH., 445 Skinner Bldg.
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DALLAS, TEX., C. W. Steen, 4136 Hawthorne
BELLEVILLE, ONTARIO, CANADA
MONTREAL, QUE., 859 New Birks Bldg.
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OSLO, NORWAY, Haehre & Co., A/S

S-A Products

Ash Handling Equipment
Belt Conveyors, Belting,
Carriers, Trippers, Drives,
Belt Tighteners and
Cleaners
Bin Gates and Valves
Boat Loading and Unloading
Equipment
Boom Conveyors
Box Car Loaders
Bucket Elevators
Car Pullers and Movers
Chains, Conveyor and Drive
Chutes, Spouts and Hoppers
Coal and Ash Handling
Equipment

Coal Crushers; Coal Tipples
Complete Excavators
Concrete Batching and Mix-
ing Plants
Conveyors and Elevators
Feeders, Steel Pan, Belt, etc.
Flight Conveyors
Gears, Sprockets, Pulleys
Glass Batch Handling Equip-
ment
Incline Cars, Safety
Live Roll Grizzlies
Loading Booms and Picking
Conveyors
Ore Washing and Drying
Plants



TRADE-MARK

*This seal identifies
correctly designed,
well-built material-
handling machinery*

S-A Products

Pan Conveyors and Feeders
Perforated Metal Screens
Pivoted Bucket Carriers
Portable Conveyors
Powdered Fuel Equipment
Pulverizers: Attrition and
Impact
Redler Conveyor-Elevators
Rock and Ore Conveyors
Rotary Grizzlies
Sand and Gravel Plants
Sand Classifiers
Screens, Revolving, Shaking,
Vibrating, etc.
Screw Conveyors
Settling Tanks and Washers

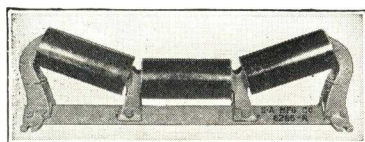
Sheaves
Skip Hoists
Speed Reducers
Steel Bins and Hoppers
Storage and Reclaiming Con-
veyors and Equipment
Track Hoppers
Transmission Equipment,
Bearings, Clutches, Shaft-
ing and Speed Changers
Variable Speed Transmissions
Vibrating Screens
Water Intake Screens
Weighing Larries
Winches and Hoists—Hand
Power or Electric

S-A Belt Conveyors

Will handle any bulk or packaged material that can be loaded onto and discharged from the wide, endless conveyor belts. Single conveyors range from 12 to 72 in. in width and from 3 or 4 to 2000 ft. in length. Loads can be carried horizontally or up inclines as steep as 25 to 30 degrees. Discharge is normally over the head pulley, but S-A fixed or movable trippers permit discharge at any point along conveyor. More complete data on tonnages handled, power required, accessories and general design are given in the S-A Belt Conveyor Catalogue.

S-A Belt Conveyor Carriers

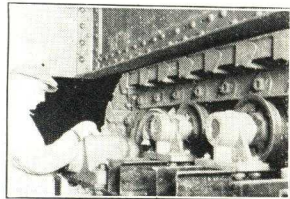
Are specially designed to carry heavily loaded conveyor belts. The rollers turn freely on ball or roller bearings, which are easy to lubricate and are thoroughly protected against dust and moisture. Frames and rollers are of steel and malleable iron—strong and unbreakable. These carriers make ideal replacements where others fail.



S-A Belt Conveyor Carrier

S-A Apron Feeders and Pan Conveyors

Are of particular value in drawing materials from bins or hoppers. They require no attendant, the feed is regular and they prevent over or under loading crushers, screens, etc. The heavy, overlapping steel pans travel 10 to 30 ft. per minute and will carry loads that would soon ruin other types of conveyors.



S-A Manganese Steel Feeder

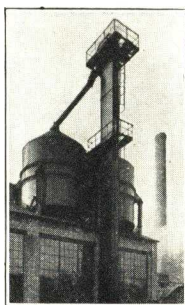
S-A Conveyors for Handling Heavy Ore and Stone

Where loads are unusually heavy and shocks severe, use S-A heavy duty belt and pan conveyors, feeders, elevators and grizzlies. Every unit is the result of years of field experience and is carefully reinforced or built of special alloy steels. S-A manganese steel feeders, with roller tracks and patented non-sagging chains, actually become tougher under the impact of heavy loads.

S-A Bucket Elevators

Built for use where bulk materials such as coal, ore, grain, sand, stone, etc., must be raised vertically or up inclines too steep for belt conveyors. Malleable iron or steel buckets, spaced on endless belts or chains, elevate the material and discharge over the head shaft. Bucket sizes and speeds vary with the material handled, size of lumps and capacity needed. Capacities up to thousands of tons per hour.

Steel Elevator Casings are designed to support drives, inspection platform, and to prevent dust.



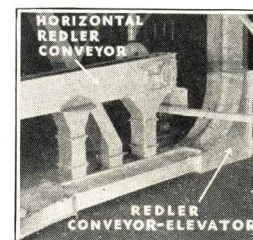
Bucket Elevator

Complete Installations and Plants

S-A engineers not only design conveyor units for handling gravel, grain, coal, castings, packages, etc., but are often asked to plan, build and equip whole plants, where materials are to be handled.

Redler Conveyor-Elevator

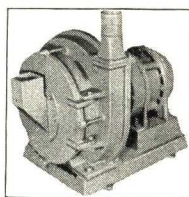
This is a type of conveyor entirely new to this country. It is unusually simple and compact and yet will carry bulk materials such as grain, coal, flour, etc., horizontally, vertically, up inclines and even around curves in the same unit. The conveyor consists of a series of skeleton flights which are pulled through an enclosed trough. It can be filled at any point on horizontal runs and the entire load flows in a solid, tranquil column wherever the trough leads. The conveying action is so gentle that there is no dust and no disturbance to break fragile materials. Can be discharged at any point on horizontal, inclined or vertical runs. Built for large or small capacities.



Redler Conveyor-Elevator

S-A Pulverizing Mills

A new type of air-swept attrition mill for fine grinding and pulverizing coal, lime, fire clay, mica, etc. Capacities are high, power consumption is low and there are few moving parts to wear. The material actually grinds itself as it is swept around the rubber-lined grinding chamber. Quickly adjusted to grind to varying degrees of fineness.



Pulverizing Mill

S-A Coal and Ash Handling Systems

Can be built into power plants of all sizes. Fuel is handled from coal car to stoker hopper without manual labor. The S-A Silo System is economical for small and medium sized power plants. It is inexpensive, flexible and is easily built into old or new plants.

S-A Skip Hoists

Are especially suited to handle coal, ashes, stone and similar abrasive or corrosive materials, as the material comes into contact with nothing but the inside of the large skip buckets. Full or semi-automatic control.

S-A Screens

A style and size for every purpose—vibrating, revolving, scalping, washing and filtering. The S-A Vibrator Screen is one of the most positive and durable screens built. Quick-change screen panels and unique saddle type stabilizers are exclusive features that make these vibrating screens easier to adjust for highest screening efficiency.

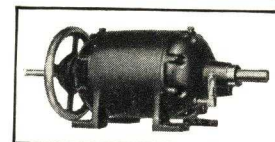
S-A Car Pullers—S-A Box Car Loader

S-A Car Pullers—Compact, power-driven units which will enable one man to spot several loaded cars. Our Car Puller folder describes the different sizes and styles with horizontal and vertical capstans.

S-A Box Car Loader—This compact machine actually throws material to the ends of a box car, filling two to four cars per hour, with sand, fertilizer, coal, etc. Easily handled by one man and eliminates all hand trimming.

"JFS" Variable Speed Reducer

This compact unit is both speed reducer and speed changer. When driven by a constant speed motor, the variable speed shaft will deliver the power at any speed within the rated limits. The unit is quiet, efficient and has a wide speed variation range. Made in plain or motorized units to transmit from $\frac{1}{2}$ to 18 hp.



"JFS" Speed Reducer

CHISHOLM-MOORE HOIST CORPORATION

DIVISION OF COLUMBUS-McKINNON CHAIN CORP.

5047 Fremont Avenue, TONAWANDA, N. Y.

BRANCHES

NEW YORK, N. Y.

CHICAGO, ILL.

CLEVELAND, OHIO

PHILADELPHIA, PA.

ST. CATHARINES, ONT., McKinnon-Columbus Chain, Ltd.

Products

"AL-LITE" ALUMINUM BALL BEARING CHAIN HOISTS.
 "CYCLONE" HAND POWER CHAIN HOISTS.
 "BLUE BOY" HAND POWER DIFFERENTIAL CHAIN HOISTS.
 "CYCLONE" ELECTRIC CHAIN HOISTS.
 "C-M" WIRE ROPE ELECTRIC HOISTS.
 "HI-UP" LOW HEADROOM ELECTRIC HOISTS.
 "MATCHLESS" TIMKEN BEARING TROLLEYS.



"MOORE" BALL BEARING TROLLEYS.
 "C-M" OVERHEAD TRAVELING CRANES.
 Also:
 "Standard" Hand Power Screw Chain Hoists.
 "C-M" Low Headroom Trolley Hoists.
 "C-M" Jib Cranes.
 Special Cranes.
 "C-M" I-Beam Monorail Systems.

HAND POWER CHAIN HOISTS



At Left:

"Cyclone" Ball Bearing Hoist

Capacities $\frac{1}{4}$ to 6 tons
 High speed. Spur geared
 8 ball bearings, 4 roller bearings
 90% efficiency
 Grease bath lubrication
 Exclusive gyrating yokes
 "Inswell" load chain
 "Cyclone" Roller Bearing Hoists
 Capacities 8 to 40 tons



At Left:

"Al-lite" Safety Hoist (Alcoa Aluminum)

Capacities $\frac{1}{4}$, $\frac{1}{2}$, 1 and 2 tons
 30% lighter
 Ball bearing
 Adjustable brake
 High speed. Spur geared
 Fewer parts
 Enclosed. Oiltight
 Safety overload governor

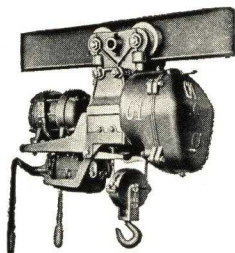


At Left:

"Blue Boy" Differential Hoist

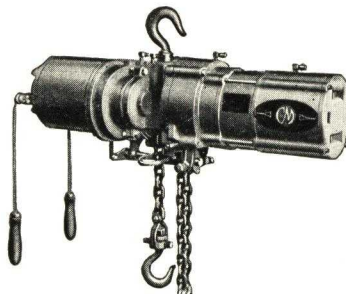
Capacities $\frac{1}{4}$ to 3 tons
 Heavy sheaves
 Reinforced ribbed frames
 "Inswell" chain
 Drop-forged hooks
 Very durable
 Copperized chain
 Painted blue duco

ELECTRIC HOISTS



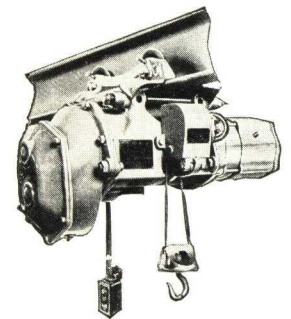
"C-M" Wire Rope Electric Hoist

Capacities $\frac{1}{4}$ to 10 tons, inclusive
 Compact, simple design
 Very accessible
 Hyatt bearings
 Hand power or motor driven trolleys
 Timken bearing wheels
 Single or variable speeds



"Cyclone" Electric Chain Hoist

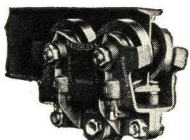
Capacities $\frac{1}{2}$ to 3 tons, inclusive
 8 ball bearings and 4 roller bearings
 Magnetic brake. Positive control
 Low headroom. Unlimited lift
 Upper and lower safety limits
 Hook or trolley suspension
 Light weight. Low price



"Hi-Up" Wire Rope Electric Hoist

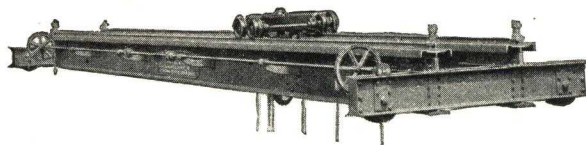
Capacities $\frac{1}{4}$ to 1 ton, inclusive
 Minimum headroom
 Maximum lift
 Very accessible
 Push button control
 Magnetic brake
 Accurate control
 Hyatt bearings

CRANES AND TROLLEYS



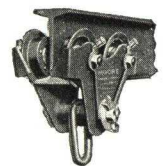
Matchless Timken Bearing Trolley

Capacities $\frac{1}{2}$ to 40 tons, inclusive
 Plain or geared
 8 Timken bearings
 Flangeless wheels
 Vertical guide rollers
 Safety lugs and bumpers



"C-M" Overhead Traveling Cranes

Capacities $\frac{1}{2}$ to 40 tons, inclusive
 Hand power and motor drive
 Single and double I-beam
 Hyatt or Timken roller bearings
 Floor or cab control



"Moore" Ball Bearing Trolley

Capacities 1 and 2 tons
 Pressed steel wheels
 Ball bearings
 Safety lugs and bumpers
 Light weight
 Adjustable

DETROIT HOIST & MACHINE CO.

Manufacturers of Hoists, Cranes, Winches, Pneumatic Motors

8201 Morrow Street, DETROIT, MICH.

NEW YORK OFFICE, 25 Church Street—Telephone, Rector 9455

Products

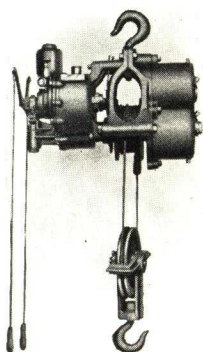
PNEUMATIC GEARED HOISTS; PNEUMATIC MOTORS; ELECTRIC HOISTS; MONORAIL HOISTS; TRAVELING CRANES; JIB CRANES; WINCHES, PNEUMATIC and ELECTRIC TURNTABLE TRACTORS.

Experience

This Company is one of the pioneer manufacturers of small power driven hoists. "Detroit" hoists have been on the market for more than 25 years, there being thousands in use throughout the world, rendering consistent service. These machines are unsurpassed in simple, accessible design, combined with durability, low initial cost and maintenance.

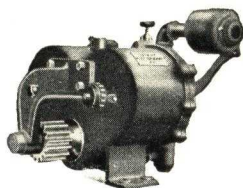
Geared Pneumatic Hoists

Built for handling loads with 80 to 100 lb. air pressure and consisting of compactly designed pneumatic motor, double oscillating cylinder type, of an unusual, simple design connected through spur gearing through hoist drum and cable. All mechanism running in oil. Capacities, $\frac{1}{4}$ to 10 tons; speeds: 5 f.p.m., largest size; to 50 f.p.m., smallest size. Lifts, 10 to 20 ft.



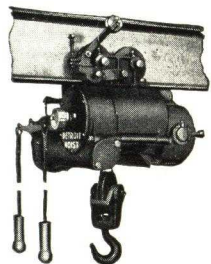
Pneumatic Motors

Same general design as used on hoists except arranged for mounting as a separate motor unit. Motors are reversible, have high torque, will operate with air or steam and built in five sizes from $2\frac{1}{4}$ to 15 hp.; speeds, 300 to 600 r.p.m. These motors have many applications where electric power is not feasible.

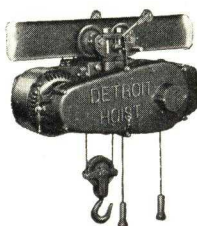


Electric Hoists

Type "MW" Electric Hoist—A compact, strong, light-weight hoist, built in two capacities, $\frac{1}{4}$ and $\frac{1}{2}$ ton. Net weight, 175 lb.; headroom, 12 $\frac{1}{2}$ in.; for any standard current and any type of suspension. Hoisting speeds, 20 and 40 f.p.m.; 11 to 20-ft. lift. Push button or rope-operated control.



Type "M" Electric Hoist—An exceptionally compact and sturdy electric hoist, built in eight capacities: $\frac{1}{4}$ to 2 tons for any standard current. Net weight, 450 lb.; headroom, 16 in. Furnished for hook, lug, hand trolley or motorized suspension. Hoisting speeds, 15 f.p.m. to 70 f.p.m.; 11 to 30-ft. lift.



Type "HR" Electric Hoist

High grade accessibly designed hoist built in twenty sizes, from $\frac{1}{2}$ to 15 tons, for any standard current. Furnished for hook, lug, hand trolley or motorized trolley suspension. Fully enclosed motor; gearing and mechanical parts all running in bath of oil. Speeds, 8 f.p.m. in largest capacities to 75 f.p.m. in smallest; lifts, 10 to 40 ft.



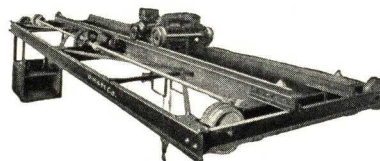
Type "LHR" Low Headroom Electric Hoist—Distinctly a low headroom design, built in same capacities as the Type "HR," having same essential, mechanical and electrical equipment.

Headroom, 19 in. to 26 in.



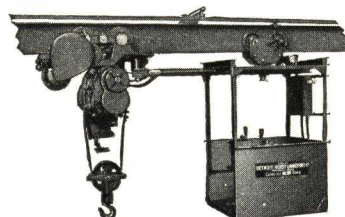
Traveling Cranes

We build a complete line of medium weight Traveling Cranes in capacities one to 10 tons; speeds, up to 50 ft. Illustration shows typical 3-motor crane.



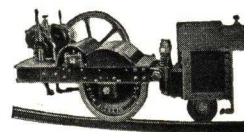
Monorail Hoists

Illustration shows typical 2-Motor Cage Operated Monorail. These hoists are manufactured in all sizes and capacities, both floor operated and cage operated.



Pneumatic Turntable Tractor

For railroad turntables; in daily use on over fifty railroads.



Inquiries

Complete specifications and prices gladly furnished. Inquiries should always give capacity, kind of current available and purpose for which hoist is intended.

HARNISCHFEGER CORPORATION

4470 West National Avenue
MILWAUKEE, WIS.

BRANCH OFFICES

BIRMINGHAM, ALA., 908 Farley Building
CHICAGO, ILL., 20 No. Wacker Drive
CLEVELAND, OHIO, 229 Rockefeller Building
DALLAS, TEX., 2223 Commerce Street
DETROIT, MICH., 452 Book Building
EVERETT, MASS., 203 Chelsea Street
HOBOKEN, N. J., 1714 Willow Avenue
JACKSONVILLE, FLA., 1052 East Bay Street
KANSAS CITY, MO., 1615 W. 51st Street
LOS ANGELES, CALIF., 2025 Santa Fe Avenue

MEMPHIS, TENN., 307 So. Front Street
MINNEAPOLIS, MINN., 818 Lumber Exchange Building
NEW YORK, N. Y., Empire State Building
PHILADELPHIA, PA., Broad Street Station Building
PHOENIX, ARIZ., 132 No. First Street
PITTSBURGH, PA., 2121 Farmers Bank Building
ST. LOUIS, MO., 7055 Dartmouth Avenue
SAN FRANCISCO, CALIF., 82 Beale Street
SEATTLE, WASH., 534 First Avenue, So.
WASHINGTON, D. C., 7611 Georgia Avenue

AGENTS IN ALL PRINCIPAL CITIES

General

P & H, the HARNISCHFEGER CORPORATION, manufactures all of the equipment here listed. From foundry to assembly shop, each step of the production is controlled by the same ideals of careful workmanship. All parts including electric motors and controls are P & H built.

Catalogues

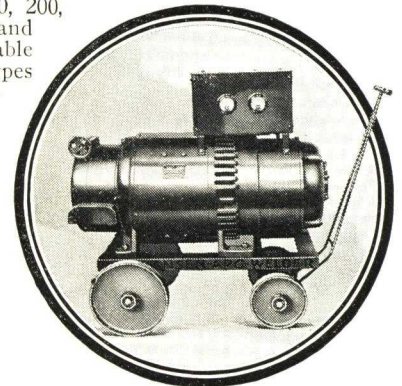
Complete catalogues embodying all dimensions and other specifications available on each unit of P & H line.

RH

P & H Hansen Arc Welders

Capacities 100, 200, 300, 400, 600, and 800 amp. Portable or stationary types operating on di-

rect or alternating current. Also, gas engine driven models in stationary, portable, and tractor mountings. Noted for its simplicity, ease of operation, and high efficiency. (Bulletin No. HW-1.)



P & H Hansen Electric Arc Welder

P & H Electric Hoists

Capacities $\frac{1}{4}$ to 15 tons. Types of mounting: hook suspension, bolt suspension, base mounting, plain trolley, motor driven trolley, and swivel type motor driven trolley.

Fast, simple to control, and sturdily built. Full push button control at no extra cost. (Bulletin No. 202-C.)



3-ton P & H Milwaukee Electric Hoist with Trolley Mounting

Covers full line of full revolving models, capacities $\frac{3}{8}$ to $3\frac{1}{2}$ cu. yds. Specifically adapted for all types of work. There are more P & H gasoline and Diesel powered excavators in operation than any other.

P & H Single Line Buckets

Capacities $\frac{1}{2}$ to $2\frac{1}{2}$ yds. For use on any crane hoist or derrick without changes in reeving.

Crawler and Truck Cranes

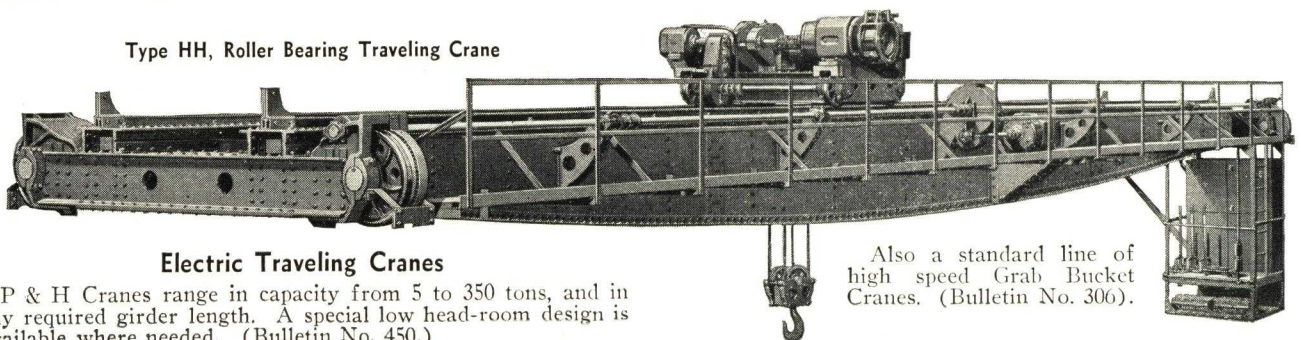
Capacities 5 to 50 tons. Standard boom lengths 30 to 100 ft. (Bulletin No. CC-1.)

P & H Excavating Machinery



A P & H Crawler Crane Equipped with Electric Magnet

Type HH, Roller Bearing Traveling Crane



Electric Traveling Cranes

P & H Cranes range in capacity from 5 to 350 tons, and in any required girder length. A special low head-room design is available where needed. (Bulletin No. 450.)

Also a standard line of high speed Grab Bucket Cranes. (Bulletin No. 306.)

THE LOUDEN MACHINERY CO.

Monorail Systems, Traveling Cranes, Motor Driven Trolleys

1029 Broadway, FAIRFIELD, IOWA

BRANCH OFFICES

BOSTON, MASS.
NEW YORK, N. Y.
PHILADELPHIA, PA.

BUFFALO, N. Y.
PITTSBURGH, PA.
CLEVELAND, OHIO

CINCINNATI, OHIO
DETROIT, MICH.
CHICAGO, ILL.

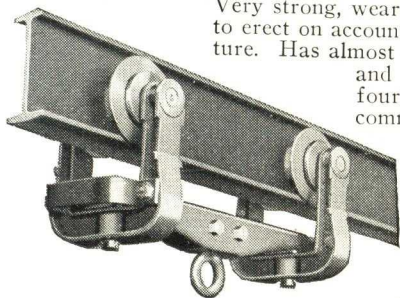
ST. LOUIS, MO.
ST. PAUL, MINN.
SAN FRANCISCO, CALIF.

Louden Monorail Systems

Complete industrial monorail systems—track, trolleys, switches, hoists, cranes, monorail scales, dipping machines, chain driven trolley conveyors, motor driven trolleys, etc. Capacities to 5000 lbs.

Track

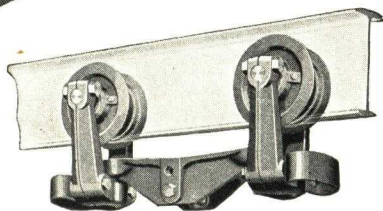
A specially designed section known as Super-Track, rolled from high carbon and manganese open-hearth steel billets. Very strong, wear resisting and economical to erect on account of saving in superstructure. Has almost twice the tensile strength and about one and three-fourths the elastic limit of common structural steel.



3000-lb. 4-wheel
Trolley for 3.33-in.
Flange



Super-Track 3.33-in.
Flange Down



1500-lb. Drop Forged 4-wheel
Trolley for 2-in. Flange

SUPER-TRACK

Trolleys

Furnished with roller, single-row ball or double-row ball bearings for operation on 2-in. flange of Super-Track. Heavy duty type trolleys for 3.33-in. flange furnished only with double-row ball bearings and ground races.

All trolleys low headroom type. Alemite-Zerk lubrication.

Switches

Two-way, three-way, cross-track and turntables. All-steel. Sliding and tongue types for loads to 5000 lbs. Can be furnished with current conductors for electrified system.

Transfer Cranes

Two types, to operate on "T" rail or Super-Track. Capacities, 500 to 5000 lbs. Can connect with stationary monorail tracks, or cranes can interlock for transferring trolleys from one to the other.

Dipping Machines

Dip loads in paint or other solutions without rehandling. Equipped with electric hoists, making them automatic or semi-automatic, or with air hoists.

Monorail Scales

Weigh loads without removing from monorail track. Various types and capacities, with beam, self-registering or dial heads.

Chain Driven Monorail Conveyors

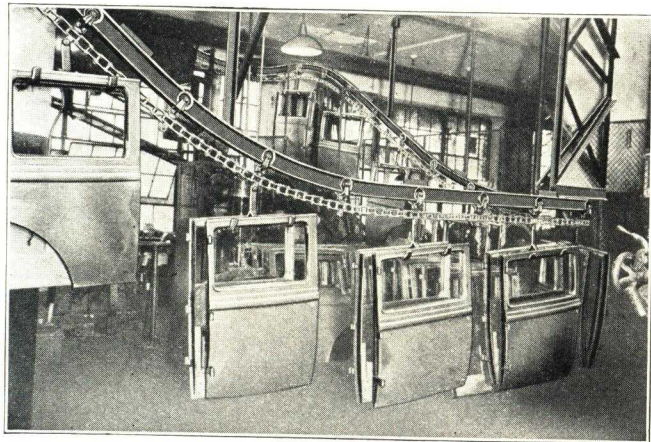
4-in. I-beam track used in most cases. Carrying capacities up to 2000 lbs. Fixed or variable speed. Track may be horizontally or vertically curved, as desired. Automatic trolley lubricating system is a feature. Track joints welded unless otherwise specified. Conveyors completely erected, if required.

Motor Driven Trolleys

Floor or cab control. With built-in electric hoist or with load bar arranged to suit where no hoisting is required. Operate on Super-Track with 3.33-in. flange down. For loads up to 5000 lbs.

Service

Our Engineering Department and our field engineers, located in principal cities, are at your service. Call on them for any assistance desired. Write for copy of "Economical Material Handling."



Chain Driven Monorail Conveyor Handling Automobile
Doors



Handling Ware on Super-Track in Enameling Plant

THE MORGAN ENGINEERING COMPANY

Builders of Cranes of Every Type and Size

MAIN OFFICE AND WORKS

ALLIANCE, OHIO

NEW YORK, N. Y., 11 W. 42nd Street

PITTSBURGH, PA., Oliver Building

Products

ELECTRIC OVERHEAD TRAVELING CRANES of all types and sizes.

Also manufacturers of Jib and Derrick Cranes, Gantry Cranes; Steam Hammers; Hydraulic Presses, Punches and Shears; Bending, Flanging and Riveting Machines; Ingot and Open Hearth Charging Machines; Ladle Cranes; Strippers; Rolling Mill Machinery; Morgan Reversible Electric Controllers; Tire Mill Plants; Forging Plants; Steel Plants; Bronze Castings; Heavy Forgings, etc.

Facilities and Service

Founded in 1868, THE MORGAN ENGINEERING COMPANY is today the oldest, as well as one of the largest builders of Electric



Overhead Traveling Cranes. The plant is advantageously located near the source of raw materials and the center of the greatest manufacturing district in the United States.

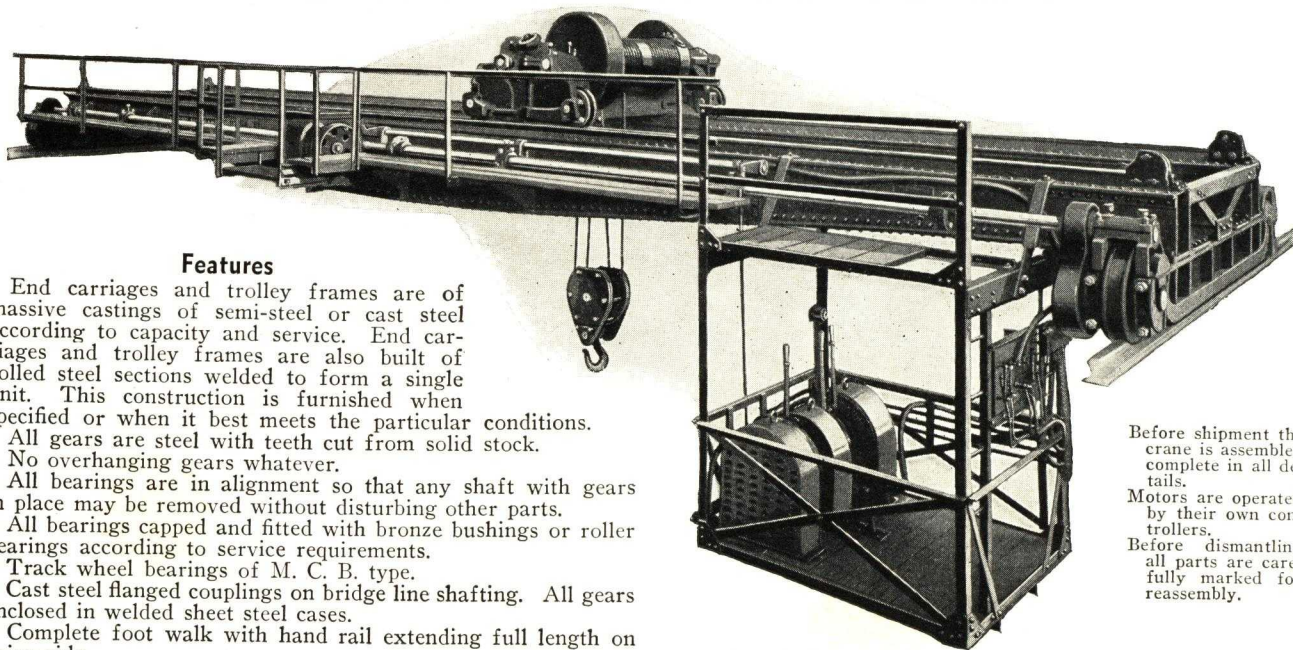
The service of a complete engineering department, with years of experience in solving crane problems, is available without charge.

All Types, All Sizes—For All Purposes

Morgan Heavy Duty Steel Mill Cranes are installed in most of the steel plants in this country, but in addition we have also furnished a large number of cranes for power house and industrial service. That same care which must be exercised in designing and building the best mill type cranes is also used in the building of Morgan Cranes for industrial and intermittent service.

Every Morgan Crane incorporates safety, accessibility, strength, rigidity, mechanical efficiency and interchangeability.

MORGAN STANDARD CRANES FOR EVERY INDUSTRIAL SERVICE



Features

End carriages and trolley frames are of massive castings of semi-steel or cast steel according to capacity and service. End carriages and trolley frames are also built of rolled steel sections welded to form a single unit. This construction is furnished when specified or when it best meets the particular conditions.

All gears are steel with teeth cut from solid stock.

No overhanging gears whatever.

All bearings are in alignment so that any shaft with gears in place may be removed without disturbing other parts.

All bearings capped and fitted with bronze bushings or roller bearings according to service requirements.

Track wheel bearings of M. C. B. type.

Cast steel flanged couplings on bridge line shafting. All gears enclosed in welded sheet steel cases.

Complete foot walk with hand rail extending full length on drive side.

The main hoist of all alternating current cranes is equipped with an electric and a mechanical brake. Dynamic braking instead of mechanical brake is usually substituted on direct current cranes.

Before shipment the crane is assembled complete in all details.

Motors are operated by their own controllers.

Before dismantling all parts are carefully marked for reassembly.

Track wheels are of rolled steel, shrunk on and keyed to axles.

All wiring is protected in iron conduit.

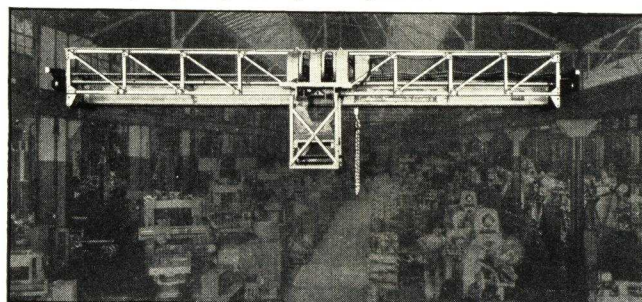
All cranes assembled and motors operated by their own controllers before shipment.

Morgan Limit Stop positively prevents overtravel of hook block.

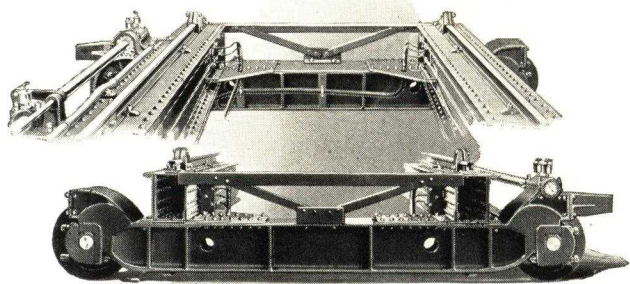
Built in any capacity and span required.



Morgan 8-ton, 4-motor, 80-ft. Span Bucket Handling Crane, Standard Portland Cement Co., Leeds, Ala.



Morgan 3-ton, 36-ft. Span Standard Industrial Crane in Machine Shop Service



Morgan Standard End Carriage

Made of box section either a casting or built up of rolled steel shapes welded into a one-piece unit.

Attached to girders by body-bound through bolts and further secured by large gusset plates.

Driving shaft bearing is full width and cast solid.

Hood is carried over track wheel solidly connecting the two prongs to resist side strain.

Oil cellar is heavy steel casting enameled inside to keep sand out of oil bath.

Track wheels of rolled steel, shrunk and keyed to axles.

Girders

Girders are usually of box section with cover plates and flange angles in one length where practical.

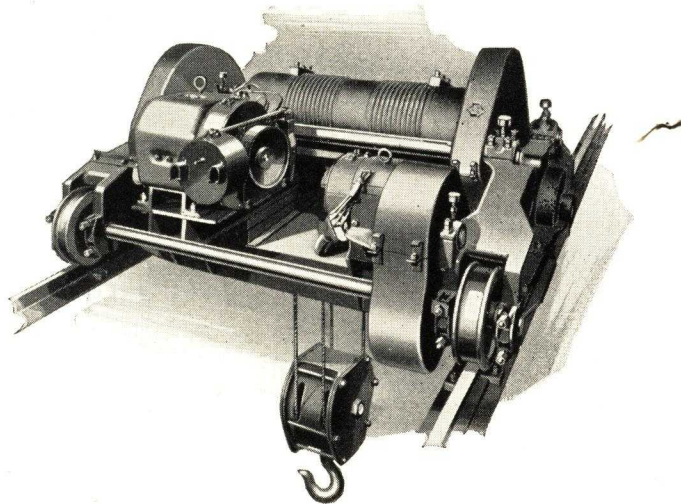
All holes for rivets are sub-punched and reamed.

Morgan Compensating Truck

Furnished on heavy capacity cranes. This truck is symmetrically constructed so that the same casting can be used on either end of the crane.

Morgan Mechanical Brake

This improved disc type brake gives perfect satisfaction. It acts instantly—stops load at exact point desired without putting undue shock on the entire crane. Adjustments are accessible but seldom necessary.



Morgan Standard Trolley Arranged for Dynamic Control

Trolley frames are steel castings of I Section securely tied together by rigid steel cross girts held in machined seats.

The wheelbase is very long in proportion to span of trolley. There are no loose brackets, all bearings being cast integral with frames.

All gears are of steel with teeth cut from solid stock.

No overhung gears; all gears are on the inside between trolley frames.

Hoist bearings are capped and fitted with bronze bushings, and provided with pressure lubrication.

All bearings are in line, permitting the removal of any shaft with its gears, without disturbing other parts.

Track wheel bearings are of the M. C. B. type. Oil cellars are heavy steel castings, enameled inside, and are of ample size to provide sufficient and reliable lubrication of the bearings, which are of bronze and flanged on the inside next to the track wheel hubs.

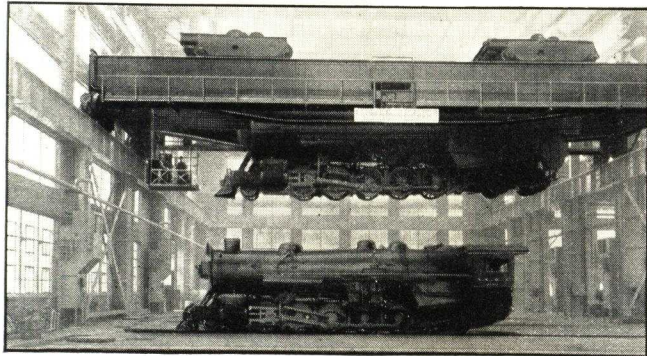
Anti-friction bearings can also be provided throughout according to service requirements.

Track wheels are of rolled steel pressed on and keyed to axles. Hook block is entirely enclosed.

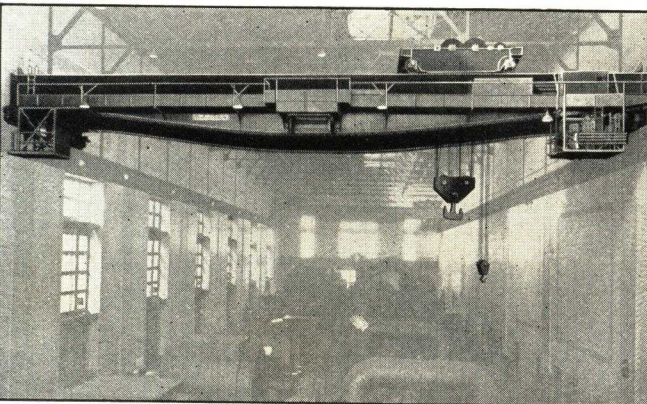
Gears are completely enclosed in welded sheet steel cases, which are split horizontally and provided with inspection holes.

Special Cranes

In addition to the large complete line of Morgan Standard Cranes, THE MORGAN ENGINEERING COMPANY has furnished special cranes to meet many unusual requirements.



Morgan 250-ton, 6-motor, 90-ft. Span "Gap-Type" Crane, Illinois Central R. R. Shops, Paducah, Ky.



One of the Two 150-ton, 95-ft. 6½-in. Span Morgan Cranes at Brooklyn Edison Company's Hudson Avenue Station, Brooklyn, N. Y.



Morgan 50-ton, 7-motor, 55-ft. Span, Double Trolley Gantry Crane with 28-ft. and 30-ft. Cantilevers, New York Central Freight Yards, Chicago, Ill.

THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue, CLEVELAND, OHIO

DISTRIBUTORS IN PRINCIPAL CITIES

Equipment

Osborn Tramrail Systems include the following:

- Teerail and Beamrail of patented design.
- Fittings for all ceiling conditions.
- Switches, cross-overs, turntables, etc.
- Yale & Towne chain blocks.
- Shepard electric hoists.
- Trolleys of superior construction and operation.
- Cranes and transfer bridges.
- Complete electric and hand-propelled systems.
- Miscellaneous auxiliary equipment for all conditions.

Engineering Service

THE OSBORN MANUFACTURING COMPANY maintain a force of trained engineers to work with manufacturers anywhere on their materials handling problems. You are invited to avail yourself of their experience in this specialized field.

Features of Osborn Tramrail Systems

Among the many noteworthy features of Osborn Tramrail Systems are: Two specially designed and patented, one-piece, rolled steel rail sections: Teerail and Beamrail, to meet all span conditions and requirements. Simplified erection. 12 to 14-lb. draw-bar pull per ton on all trolleys. Unusually low headroom provisions. Capacities, up to 6000 lbs. Unusual flexibility of unit designs to effect an almost limitless number of combinations of units. Made entirely of steel. Large factors of safety in units and combinations. Smooth, easy, safe operation, maximum durability with minimum maintenance costs.

Teerail

The distinctive design of Osborn Teerail introduces advantages that are not obtainable in ordinary rails.



Teerail

Features—Easy handling and installing. An unusually high load capacity with minimum number of suspension supports. Great strength and resistance to bending of flange corner at joints. Exceptionally long life and resistance to the peening action of trolley wheels. Teerail can be easily bent to desired curves in the field. A

high degree of safety is assured by the combination of sturdy, efficient design with high quality materials.

Beamrail

Beamrail provides an ideal runway for trolleys, cranes, and transfer bridges in Osborn Tramrail Systems where span conditions are too great for Teerail. In general, for long spans it is more economical to use Osborn Beamrail than to use superstructure and Osborn Teerail. Beamrail is for use only on straightaways, Teerail being used on all curves.



Beamrail

Some of the principal features of Osborn Beamrail are:

Wide, Heavy Compression Flange—Equivalent in size to flange of a 20-in. I-Beam and providing a high degree of strength and safety.

Deep Web—Makes possible exceptionally long spans.

Rail Tread—Identical in design and size to Osborn Teerail tread. Thickness and strength of tread prevent transverse bowing of the flange.



Bolt and Rivet Holes—Jig drilled at the factory, which minimizes field assembly. This assures smooth, solid rail joints, smooth trolley operation and increases speed and lowers cost of erection.

Trolleys

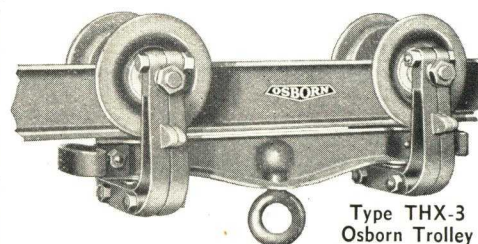
Successful performance of a tramrail system is largely dependent upon the successful performance of the trolleys. Osborn Tramrail Trolleys possess rugged strength, low drawbar pull, smooth operation and high factors of safety.

The complete line of hand and motor propelled Osborn Tramrail Trolleys represents sound engineering principles in every detail.

Features—

Capacities, up to and including 3 tons. Standard and special designs will meet practically all tramrail materials handling requirements. Can be used in combination with practically every standard make of hand-powered, electric-powered or pneumatic hoist.

The wheels are made of heat treated steel. The wheel has a crowned rolling tread, approximating a spherical section, which moves the hammering action of the wheel in from the edge, where the rail is better able to withstand the resulting peen. It also gives an approximation to point contact with the rail, insuring a minimum of rolling friction.

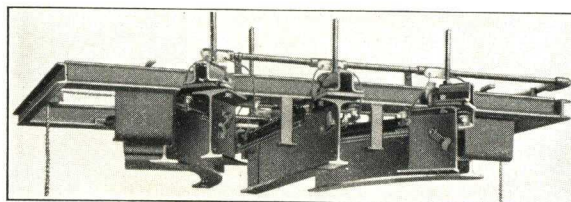


Type THX-3
Osborn Trolley

Sliding Switches

These switches are absolutely safe. Under no conditions can a trolley come off, even if operator deliberately tries to make it do so.

Features—Carriage is on roller bearings, and positively locks in position. No angular cuts on entering rails. Safety devices make them 100% safe. Simplified erection. Switch track is curved so that trolley receives no impact in passing through switch. Supported by a "line of steel."



Type SEW-4 Osborn Sliding Switch

Tongue Switches

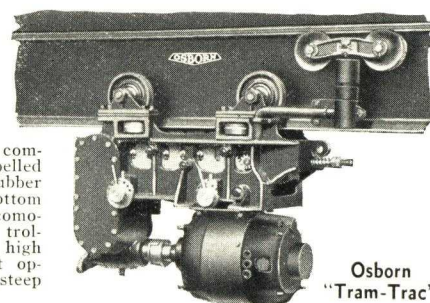
Designed for hand propelled systems. Can be used right or left-hand, Y or 3-way.

Cranes and Transfer Bridges

Underslung type. Osborn cranes and transfer bridges will not bind. This is due to flexibly suspended runways and swiveling trolleys on the end trucks.

Osborn Tramrail Tractor

The "Tram-Trac" is a compact electrically propelled tractor. Driven by rubber pads pressed against bottom of rail. Used as a locomotive to pull trains of trolleys. Its unusually high tractive power makes it operate successfully on steep grades.



Osborn
"Tram-Trac"

SHEPARD NILES CRANE & HOIST CORPORATION

428 Schuyler Avenue, MONTOUR FALLS, N. Y.

WORKS: MONTOUR FALLS, N. Y.; PHILADELPHIA, PA.

ATLANTA, GA.
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SEATTLE, WASH.
TORONTO, ONT.

EXPORT SHEPARD DIVISION: 30 Church Street, NEW YORK, N. Y.

NILES DIVISION: Niles-Bement-Pond Co., Foreign Department, 111 Broadway, NEW YORK, N. Y.

SPRAGUE DIVISION: International General Electric Co., SCHENECTADY, N. Y.

Products

ELECTRIC HOISTS (Cage and Floor Operated)
SHEPARD MONORAIL TRACK
ELECTRIC TRAVELING CRANES
TRANSFER CRANES
JIB CRANES
GRAB BUCKET CRANES

GANTRY CRANES
ELECTRIC WINCHES
CAR PULLERS
WALL CRANES
ELECTRIC CUPOLA CHARGING HOISTS AND CRANES
HAND POWER CRANES
BACK-GEARED MOTORS
SPEED REDUCERS

SHEPARD DIVISION



NILES DIVISION



SPRAGUE DIVISION



TRADE-MARKS

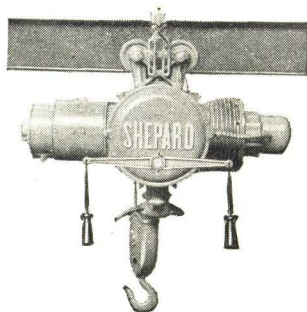
Co-operative Service and Catalogues

The comprehensiveness of the Shepard Line permits the selection of the most efficient lifting and load-moving machinery for any particular need. This Company will plan, design and help in any way to determine where real savings can be made.

Catalogues describing Shepard Niles hoists and cranes are available.

Detailed data can be obtained from any of our branch offices.

Shepard Electric Hoists



General Utility Compact Hoist

For every application, floor or cage operation or remote control—high speed, close clearance, long lift, single or multiple hook—a hoist for every condition.

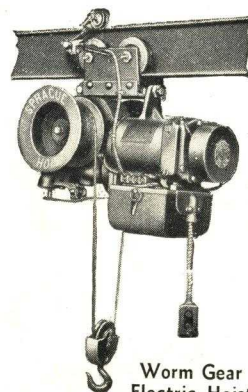
All hoists are of the "balanced drive" design, with mechanism totally enclosed in dust and moisture-proof housings, and lubricated by an oil bath to assure positive lubrication.

Hoists are available for operation on all commercial circuits up to 550 volts, both d-c. and a-c., 2 or 3-phase, 25 or 60 cycles.

Sprague Electric Hoists

These hoists are featured by a worm gear drive which has few moving parts. The worm is also the load brake—the angle of the worm is such that it cannot overspeed in lowering.

All gears are entirely enclosed and packed in grease. Built in capacities of from $\frac{1}{4}$ to 6 tons, for pendent rope, push button or foundry control. For d-c. and a-c. circuits up to 550 volts.



Worm Gear Electric Hoist

Cage Operated Electric Hoists

Built in a variety of types from $\frac{1}{2}$ to 10 tons capacity. For complete information write for Shepard's "Aerial Railway of Industry."

Floor Operated Hoists

A comprehensive line of 1 and 2-motor floor controlled electric hoists with single or multiple speed control. Capacities from $\frac{1}{4}$ to 20 tons, in the following types: Lug Suspension; Hook Suspension; Stationary; Push Trolley; Geared Trolley; and Motor Driven Trolley. Furnished with pendent rope, push button, outrig or remote control.

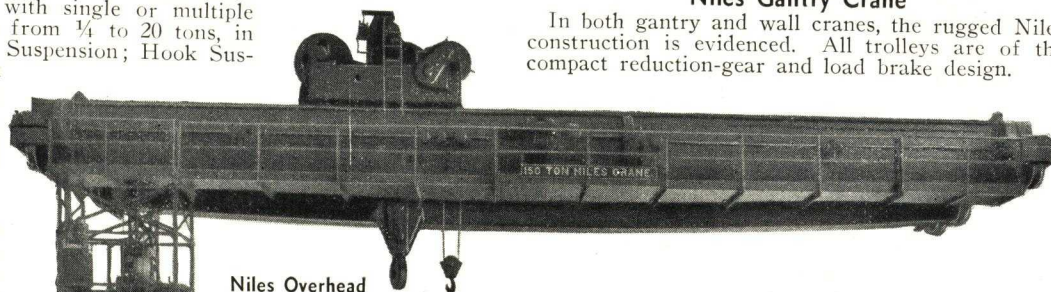
Electric Traveling Cranes

A complete line in capacities from $\frac{1}{4}$ to 450 tons. The small capacity cranes are of the Shepard "balanced drive" design while the larger capacities employ the Niles enclosed compact reduction-gear and load brake.

Types—Overhead Electric Traveling Cranes: 3-motor cage or floor operated; box or rolled girders; single or twin hook; auxiliary hoists; extension; close clearance and submerged trolleys. Grab bucket; single beam; double beam; gantry; jib; bracket and transfer cranes. Also special types.

Shepard Crane Trolleys

All Shepard Crane Trolleys are of the "balanced drive" design with mechanism enclosed in dust and moisture-proof housings; oil bath lubrication; unit construction makes each part separately accessible.



Niles Overhead Traveling Crane

Niles Gantry Crane

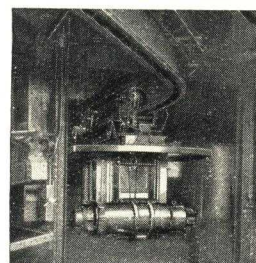
In both gantry and wall cranes, the rugged Niles construction is evidenced. All trolleys are of the compact reduction-gear and load brake design.

Sprague Vertical Winches

Built in capacities up to 12 tons and available in a variety of speeds ranging from 10 to 150 ft. per minute, for d-c. and a-c. circuits up to 550 volts. Furnished with foot-operated non-reversible controller.

Shepard Monorail Track

T-rails of special analysis steel provide a hard, smooth surface. Track is attached to I-beams by bolts and spreader castings. Large area bearings in trolley wheels insure great durability and long life.



Monorail Track

WHITING CORPORATION

Cranes of All Types

(Also Foundry Equipment, Pulverizing and Combustion Equipment, Stokers, Railroad Equipment, Evaporators and Special Machinery)

15611 Lathrop Avenue, HARVEY, ILL. (Chicago Suburb)

REPRESENTATIVES IN PRINCIPAL CITIES

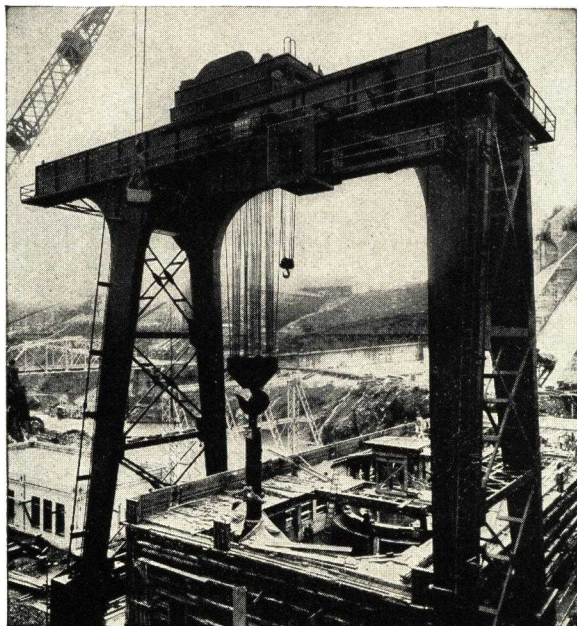
For Pulverized Coal Equipment, see other page of Whiting Corp.

Products

CRANES: Electric Traveling Cranes; Bucket Cranes; Magnet Cranes; Gantry Cranes; Cupola Charging Cranes; Powerhouse Cranes; Railroad Cranes; Low Head-room Handpower Cranes; Jib, Pillar, and Bracket Cranes.

Electric Traveling Cranes, 3 to 350 Tons

WHITING CORPORATION has built cranes of every capacity and for every class of service, inside and outside. Practically any span; alternating or direct cur-



350-ton Electric Gantry Traveling Crane in Power Plant of Inland Power & Light Co., Ariel, Wash. Largest of Its Kind. Span 67 Ft. Height 99 Ft.

rent; cage or floor control. Trolleys may be arranged for handling clamshell bucket or lifting magnet.

Whiting Tiger Electric Traveling Crane

The Tiger Crane is characterized by endurance, low power-consumption, slight maintenance expense, smooth and dependable operation, and faster, better crane service. It is the result of forty years' successful experience in crane building. Note the following features of superiority:

Herringbone gears—but two gear reductions, smooth, quiet, more efficient, longer wearing.

One-piece steel frame for all bearings in each gear train—permanent gear alignment.

Hyatt roller bearings on all gear and wheel shafts.

Oil-flushed mechanical brake. Oil pumped into brake by meshing of nearby gear reduction.

Complete oil-bath lubrication for gears and gear bearings. Alemite lubrication for other than gear bearings.

Welded, oil-tight gear housings, removable cover.

Steel trolley frame welded into one piece.

Steel end trucks welded into one piece.

Strong, well diaphragmed girders.

All-steel diamond tread footwalk, and handrail, full length of bridge.

Bridge drive by compact gear unit located at center of span; squaring shaft coupling attaches direct to axle wheel bearings.

"Safety first" all-enclosed switchboard. Every other possible safety device.

No overhung gears.

All parts quickly accessible. Standard parts carried in stock.

Flexible design, adaptable to all conditions. Compact, low-headroom design, high lift of hook, and small end clearance a feature of this crane.

Gantry Cranes

Various styles; any capacity or span, with or without cantilever extension at one or both ends. Rugged, well-braced bridge construction; vertical and horizontal drive shafts held in a single casting bearing.

Railroad Cranes

Overhead travelers for locomotive and coach shops, any capacity or span. Gap type construction saves headroom.

Steel Mill Cranes

Built to customer's specifications or from own designs.

Handpower Traveling Cranes

Low headroom design with Hyatt roller bearings. Any capacity.

Jib Cranes

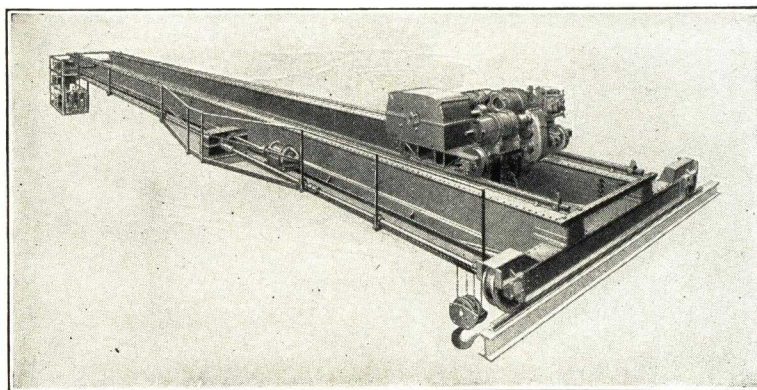
All types, handpower, pneumatic or electric.

Pillar Cranes

Various styles for inside or outside service—handpower, pneumatic or electric.

Catalogue

Send for Catalogue 214.



5-ton Whiting Tiger Crane

WRIGHT MANUFACTURING CO.

Manufacturer of Cranes and Hoists

YORK, PENNSYLVANIA



Wright High Speed Hoist

Recommended where heavy loads must be lifted quickly and easily. Its design, ruggedness and precision of manufacture mean long life—50 to 199 per cent longer life than the ordinary spur geared hoist.

A Timken tapered roller bearing at the lower swivel hook prevents the load chain from becoming twisted. Thus, the load chain always rides squarely into wheel pockets. This feature reduces wear, insures against unevenness of motion, and eliminates possibility of break due to a shock load on a twist.

A new patented load chain guide completely shrouds the upper half of the load sheave—another Wright safety feature which prohibits the load chain from over-riding out of the load pockets. It also protects the load pockets from dust and dirt.

The load chain is of special analysis steel to give strength and long life. Each link is electrically welded on the side, and is die formed to assure evenness of pitch.

The main driving spindle runs on a ball bearing which greatly reduces wear at this vital point. The hoist is easily oiled—spring covered oil tubes go to all vital parts.

A loop hand chain guide prevents hand chain fouling.

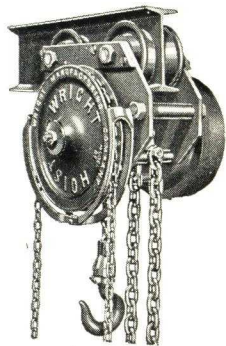
Wright-Way Hoist

The Wright-Way Hoist is the latest addition to the Wright Line of hoisting equipment. It is a complete departure from ordinary low cost hoists—entirely new in design and twice as efficient.

The design is based on the ordinary type of differential hoist. Wasteful friction is reduced by the use of heavy duty ball bearings in each sheave.

The Wright-Way Hoist includes many features formerly found only in high priced hoists, such as, roller bearing swivel hook, precision formed pocket wheels, special analysis steel chain, drop-forged hooks and malleable iron yokes.

The Wright-Way Hoist is all that the name implies. In capacity, ease of operation, long life and price, it fills the needs of hoist users who have been unable to justify the purchase of a high priced hoist.



Plain Type



Army Type Trolley Hoist

Constructed by building a Wright High Speed Hoist into a Wright Timken Tapered Roller Bearing Trolley—retaining the features of both.

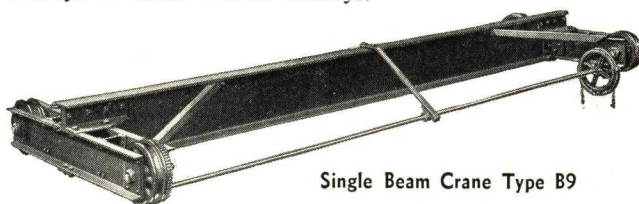
It is recommended for use where headroom is limited and where a combined trolley and hoist are desirable.

Made in both plain and geared types.

The Wright Special Low Headroom Trolley Hoist, Type 600, is recommended for use where headroom does not permit the use of the Army Type.

Wright Hand Traveling Crane with Timken Tapered Roller Bearings

These cranes are built in every capacity and span to suit any installation condition. For lifting they should be equipped with Wright High Speed Hoists, Wright Trolley Hoists, or Wright Electric Hoists—for cross travel with Wright Plain Trolleys or Motor Driven Trolleys.



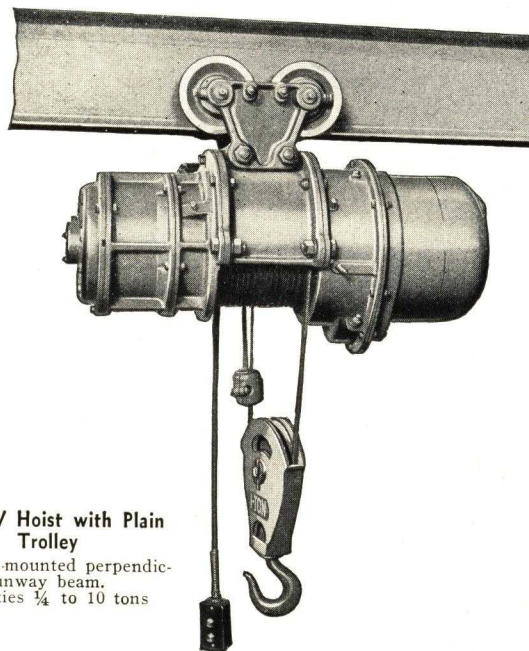
Single Beam Crane Type B9

All truck wheels run on Timken tapered roller bearings and are supported on large steel axles which are securely fastened in the truck frame.

Note: End trucks can be furnished separately either with or without squaring shaft, handwheel, and pendant chain, so that you may purchase the necessary I-beam locally and fabricate the crane in your own shop.

Wright Electric Hoists

Recommended for installations where high operating speeds, economical operation, and low-cost maintenance are first essentials. A few of the many features are: alloy steel shafts, drop-forged heat-treated gears and pinions, Tru-Lay Preformed cable and fully enclosed dustproof, weatherproof motors.



Type W Hoist with Plain Trolley

Can be mounted perpendicular to runway beam.
Capacities $\frac{1}{4}$ to 10 tons

Other Items

The Wright Line of Hoist Equipment includes standard types of Screw Hoists, Differential Hoists, Trolleys, Jib Cranes, Winches, Electric Cranes. Complete catalog and prices on request.

CLYDE SALES CO.

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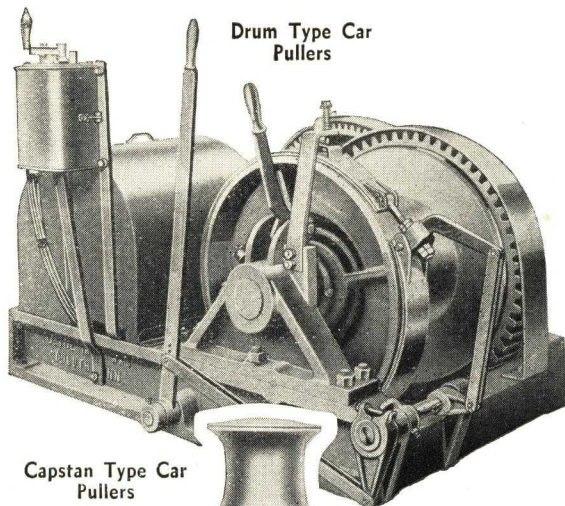
MEMPHIS, TENN., 1618 Sterick Building
Hamilton Street

Products

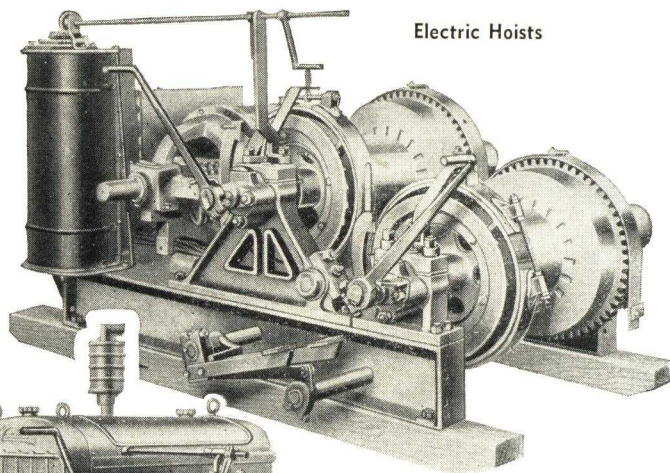


GASOLINE, ELECTRIC, STEAM and BELT HOISTS; ELECTRIC CAR PULLERS; STEEL and TIMBER DERRICKS of all descriptions; CLYDE-WILEY WHIRLEYS.

Also Dredge and Dock Equipment; Sugar Cane Handling Equipment; Derrick Fittings and Blocks; Steam and Gasoline Logging Equipment.



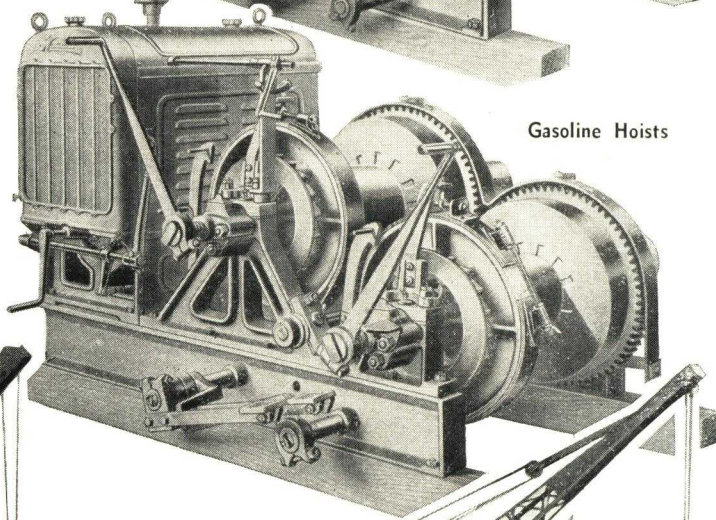
Drum Type Car Pullers



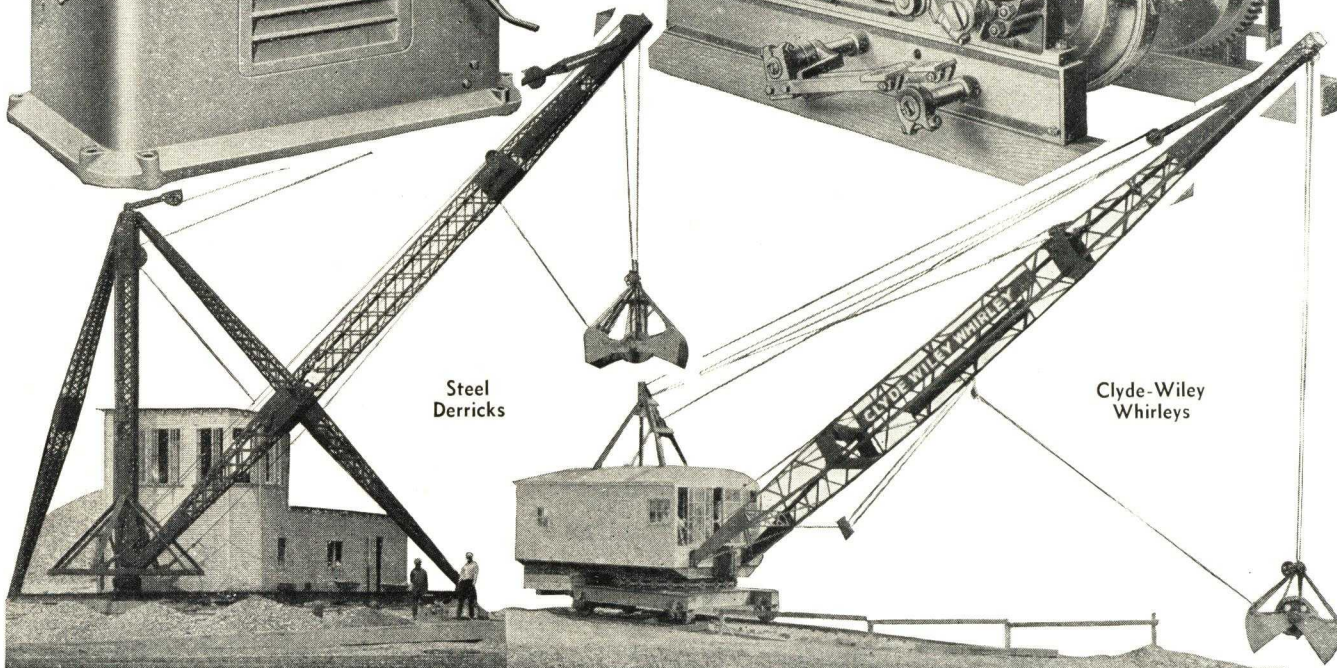
Electric Hoists



Capstan Type Car Pullers



Gasoline Hoists



Steel Derricks

Clyde-Wiley Whirleys

THE HAYWARD COMPANY

Hudson Terminal Building
NEW YORK, N. Y.

AGENCIES

CLEVELAND, OHIO, E. J. Robeck, 405 Chester Twelfth Building
SAN FRANCISCO, CALIF., Percy Keatinge, 681 Market Street

CHICAGO, ILL., R. W. Hawkins & Co., 122 So. Michigan Avenue

Products and Service

CLAM SHELL BUCKETS; ELECTRIC MOTOR CLAM SHELL BUCKETS; ORANGE PEEL BUCKETS; DRAG LINE or DRAG SCRAPER BUCKETS; CABLE TAKE UP REELS.

Manufacturers also of Counterweight Drums, Coal Handling, Dredging and Traveling Machinery; Skid Excavators; and Snow Handling Buckets.

The four separate types of Hayward Buckets cover the whole field of grab bucket usage. For this reason a Hayward recommendation is unbiased. It is based exclusively upon your individual needs.

Catalogues and pamphlets on request.



Clam Shell Buckets

Class "E" Type—For digging and rehandling bulk materials such as sand, gravel and crushed stone. Can be fitted with teeth for digging the harder materials from the natural state. In proportion to size the ore or flat bottomed bowl bucket, because of its shovel-like blades, carries larger loads and digs harder materials than the regular or curved bowl bucket. Built in sizes from $\frac{1}{2}$ cu. yd. up, in standard and extra heavy types.

Dwarf sizes from $1\frac{1}{2}$ cu. ft. to 9 cu. ft.

A Class "E" Clam Shell Bucket of special light weight construction is furnished and recommended for handling coal and coke.

Class "K" Type—A powerful digging clam shell bucket suited to natural excavating, hard digging and speedy rehandling work. Operated on three, four, five or six parts of line according to the material handled, the Class "K" provides a single bucket for practically all digging and rehandling work. Furnished with or without manganese steel teeth.

Built in sizes from $\frac{1}{4}$ cu. yd. up.

Electric Motor Type—Used in power and industrial plants for digging and rehandling coal, ashes, ore, coke, slag and similar materials. Requires no closing line. Can be instantly attached to crane, electric hoist or ordinary derrick. Opening and closing of bucket accomplished by motor within the bucket, controlled by lever in operator's cab. Built in sizes from $7\frac{1}{2}$ cu. ft. up, with alternating or direct-current motor.

Orange Peel Buckets

Standard Type—An all-purpose contractor's bucket for sewer work, digging in gravel banks, removing overburden, dredging, excavating and rehandling rocky materials. Strong, ruggedly built, this Standard Type offers a bucket that will meet severe bucket requirements. Also available in an extra heavy type.

Sizes from 2 cu. ft. up.

Multi-Power Type—Two-part side chains give nearly 60% greater penetrating and closing power than in Standard Orange Peel Buckets. Recommended for digging and rehandling clay, compact sand or any similar material free from large

rocks or solid substances.

Built in sizes from 2 cu. ft. up.

Three-Bladed Type—Designed to handle blasted rock, boulders, and other hard, odd-shaped materials. Also suitable for heavy digging, back-filling and excavating in rocky soil formations. Available, as well, in an extra heavy type.

Sizes from 21 cu. ft. up.

Dwarf Type—Hand operated digging bucket for work where space is limited. Similar in construction to larger Hayward Orange Peel Buckets. A hammer weight attachment (as shown in cut) for digging harder and more compact materials can be supplied when needed.

Built in sizes from 100 cu. in. to 1 cu. ft.

Corresponding over-all diameters 10 to 22 in.

Drag Line or Drag Scraper Bucket

Hayward Drag Line Buckets are used for digging either loose muck, compact material, stone, boulders, lump coal and similar materials.

Two designs, Open Front Type and Hooded Type, are furnished.

The Open Front Type permits free loading and discharging without hindrance from obstructing bales or pulling bridles.

It carries a full load to end of boom without spilling. Short pulling bridles enable this bucket to fill within its own length and to dump quickly. The Open Front Design without projections other than teeth, makes possible placing the cutting edge at any predetermined angle to bank, regardless of bank slope.

Low head room permits operation with short boom.

The Hooded Type Drag Line has corresponding advantages. It is recommended for light, medium and heavy work.

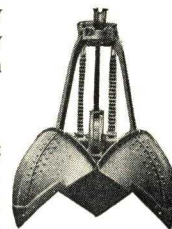
Capacities both types from $\frac{1}{4}$ cu. yd. up.

Automatic Cable Take Up Reel

Automatically pays out and takes up cable used for operation of Hayward Electric Motor Buckets and lifting magnets, responding to every movement of magnet or bucket. Flexible cable up to 1-in. diameter and up to 150 ft. long can be handled by Standard Model. Other models for larger or longer cables.



Multi-Power Orange Peel Bucket



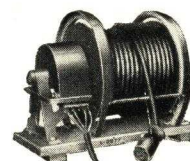
Three-Bladed Orange Peel Bucket



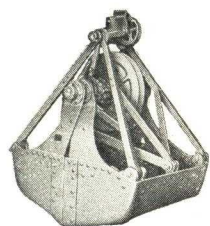
Dwarf Orange Peel Bucket



Drag Line or Scraper Bucket



Standard Automatic Cable Take Up Reel



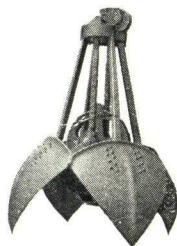
Class "E" Ore Bowl Clam Shell Bucket



Class "K" Clam Shell Bucket



Electric Motor Clam Shell Bucket



Standard Orange Peel Bucket

BLAW-KNOX COMPANY

Manufacturers of Clamshell, Single Line and Dragline Buckets
2041 Farmers Bank Building, PITTSBURGH, PA.

For Sales Offices, see Steel Grating Pages
For Other Products, see Manufacturers' Index

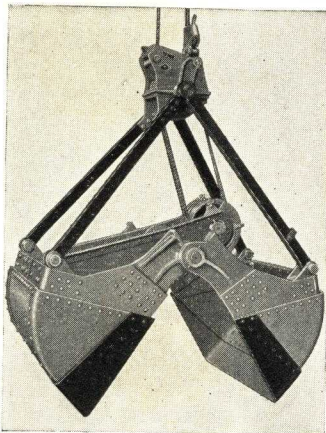


Heavy Duty Digging Type Drednaught Buckets

Built for the most severe kinds of excavation and dredging work, for digging anything that can be dug by clamshell. They stand the abuse and hard service commonly encountered in handling stumps, boulders, broken shale, rock, etc.

The scoops, corner bars and lips are much heavier than in ordinary construction. Sealed ball bearing sheaves, scientifically tempered cutting lips and teeth prolong their life in service and keep maintenance low.

Ask for Catalog No. 1339.

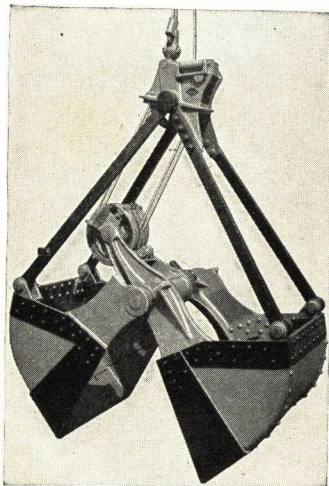


Light Weight Rehandling Type Drednaught Buckets

Built in a wide range of sizes and designed especially for handling loose materials, such as sand, gravel, coal, crushed stone, etc. This type of bucket is especially adaptable to barge work because of the great deck covering area obtained by long spread and width of scoops. The design of the bucket provides for a combination of maximum strength with minimum weight, an outstanding requirement for buckets of this kind.

Available in heavier weights for handling heavier materials.

Ask for Catalog No. 1339.



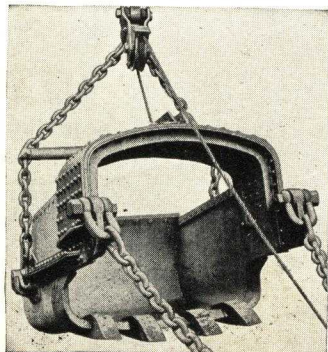
Medium Weight General Purpose Drednaught Buckets

Meet a very broad range of requirements. Their capacity is based on a rated load of 1½-in. stone from cars. When handling coal or sand, they will handle a much greater load. When fitted with teeth, buckets can dig capacity loads in any ordinary excavation.

Unless otherwise specified, these buckets are furnished without teeth, but lips are always drilled and plugged so that teeth may be attached by removing plugs.

Counterweights can be furnished for buckets up to 1-yd. size.

Ask for Catalog No. 1339.



Dragline Buckets, Medium, Light, and Heavy Weight

Available in capacities from ⅜ to 6 cu. yd. and designed to meet the requirements of the hardest kind of digging.

All Blaw-Knox Dragline Buckets are of rugged construction and liberally reinforced at points of greatest stress—the sidewalls do not pull in.

Ask for Catalog No. 1247.

HEAVY DUTY DIGGING TYPE DREADNAUGHT BUCKETS

For Excavating and Hard Digging

Size No.	Rating, cu. yd.	Weight, lb.	Max. height, ft. in.	Open length, ft. in.	Width, ft. in.	Cable over-haulage, ft. in.
605	⅜	1900	7 11	6 3	2 0	22 8
607	½	2200	7 11	6 3	2 5	22 8
609	¾	2400	7 11	6 3	2 8	22 8
613	¾	3300	8 6	7 0	3 2	24 2
715	1	4300	9 9	7 7	3 6	26 5
717	1¼	4900	10 6	8 2	3 9	28 6
721	1½	5875	10 11	8 8	4 0	30 10
723	1¾	6500	11 9	9 2	4 2	31 10
725	2	7200	12 3	9 6	4 4	33 3

LIGHT, MEDIUM, AND HEAVY WEIGHT DREADNAUGHT BUCKETS

For Rehandling

Size No.	Rating, cu. yd.	Weight, lb.	Max. height, ft. in.	Open length, ft. in.	Width, ft. in.	Cable over-haulage, ft. in.
718	1¼	3865	8 8	7 10	3 10	21 10
720	1½	4200	9 0	8 4	4 1	22 11
720-L	1½	4000	9 0	8 4	4 1	22 11
720-S	1¾	4550	8 9	8 5	4 9	26 8
722	1¾	4600	9 6	8 10	4 4	24 1
722-L	1¾	4400	9 6	8 10	4 4	24 1
722WS	2	4800	9 7	8 6	5 2	25 2
722-S	2	4600	10 1	9 5	5 2	26 10
724	2	5250	9 11	9 3	4 6	25 2
724-W	2	5250	9 10	8 4	5 7	25 5
724-L	2	4750	9 11	9 2	4 6	25 2
726	2¼	5850	10 4	9 7	4 8	26 2
730	2½	6200	10 8	9 11	4 10	27 2
724WS	2½	5100	10 9	9 6	5 2	28 6
734	3	7300	11 4	10 3	5 2	28 9

MEDIUM WEIGHT GENERAL PURPOSE DREADNAUGHT BUCKETS

For Rehandling and Light Excavating

Size No.	Rating, cu. yd.	Weight, lb.	Max. height, ft. in.	Open length, ft. in.	Width, ft. in.	Cable over-haulage, ft. in.
603	⅜	1025	6 3	5 0	2 4	18 0
604	½	1410	6 8	5 4	2 5	17 8
606	¾	1900	7 2	5 11	2 9	19 8
608	¾	2200	7 0	7 3	3 0	22 8
611	¾	2800	8 3	6 10	3 1	22 6
616	1	3500	9 1	7 6	3 5	24 6
716	1¼	4000	9 2	7 11	3 10	23 11

MEDIUM, LIGHT AND HEAVY WEIGHT DRAG-LINE BUCKETS

Size No.	Rating, cu. yd.	Weight, lb.
Medium Weight		
12	⅜	1000
15	½	1665
22	¾	2200
28	1	3000
35	1¼	3300
41	1½	4000
48	1¾	4800
55	2	5500
60	2½	7100
65	3	8100
70	3½	8800
75	4	9500
80	4½	10500
85	5	11500
90	6	14400
Light Weight		
10-L	⅜	735
15-L	½	1300
28-L	1	2525
35-L	1¼	2820
41-L	1½	3125
55-L	2	4200
60-L	2½	5265
65-L	3	5900
Heavy Weight		
22-H	¾	2625
28-H	1	4075
35-H	1¼	4425
41-H	1½	5650
55-H	2	6900

Blaw-Knox Special Dreadnaught Buckets, Round Nose Digging and Railroad Types

Heavy duty round nose buckets are frequently required for extremely hard digging in hard pan, shale, etc. The massive and rugged construction of these Blaw-Knox buckets enables them to withstand all kinds of abuse. They are practically immune to distortion.

Blaw-Knox railroad ballast digging buckets are especially designed for digging ballast on the railroads and are furnished with either square or round nose scoops equipped with suitable teeth for digging stone.

Ask for Catalog No. 1339.

Blaw-Knox Single Line Buckets, Hook-on and Direct Reeved Types

Hook-on type buckets are furnished completely equipped with closing line reeved up and with a hook-on yoke ready to operate when yoke is slipped over crane hook.

They are easily and quickly un-yoked when crane is required for other duties.

The direct reeved type bucket is suitable for permanent installation on single drum hoists or cranes.

Fully described and illustrated in Catalog 1224.

Blaw-Knox Bull Wheel Buckets with Low Headroom for Easy Rehandling

These buckets have adequate digging power for handling slack coal, hard coal, ashes, cinders, granulated blast furnace slag, coke breeze, garbage and similar materials, but are not recommended for uses where any great digging power is required.

This type of bucket has outstanding advantages where headroom clearances are limited.

Write for complete descriptive data.

Large Heavy Duty Dreadnaught Buckets for Steel Mill Service

These buckets are designed for handling limestone, ore, etc., in the open hearth stockyard, and for digging open hearth slag, two of the hardest jobs for which clamshells are used.

Blaw-Knox has obtained wide recognition among the steel companies for buckets meeting the requirements of this service and are prepared to submit specifications for buckets to your order.

Write for descriptive folder, Form 1156.

BLAW-KNOX SPECIAL DREADNAUGHT BUCKETS

Size No.	Rating, cu. yd.	Wt., lb.	Max. height, ft. in.	Open length, ft. in.	Width, ft. in.	Cable over-haulage, ft. in.
Railroad Type for Ballast Digging						
606RR	1 1/2	2100	7 2	5 11	2 9	19 8
611RR	3/4	2850	8 1	6 10	2 10	22 6
616RR	1	3575	9 1	7 5	2 10	24 6
614RN	3/4	3390	8 3	7 10	2 10	22 6
618RN	1	4300	10 10	9 5	2 10	27 3

Round Nose Type for Caisson Work

607RN	1 1/2	2250	8 0	6 10	2 5	22 8
616XRN	1	4550	9 2	7 11	3 6	24 6
717RN	1 1/4	4650	10 5	8 5	3 8	28 6
721RN	1 1/2	5475	10 11	9 0	3 11	30 10

BLAW-KNOX HOOK-ON TYPE SINGLE LINE BUCKETS

Size No.	Rating, cu. yd.	Wt., lb.	Operating head room when reeved internally, ft. in.		Scoop spread open, ft. in.	Width outside, ft. in.
			2 Parts	3 Parts		
300S	1/8	1250	10 11	.....	4 10	2 4
302	3/8	1425	.....	14 2	4 10	2 9
305	1/2	2300	12 8	15 10	5 1	3 0
310	3/4	2800	14 5	18 2	6 6	3 2
310W	1	3200	14 5	18 2	6 6	4 2 1/2
311	3/4	2700	9 0	12 9	6 6	3 2
311W	1	3350	9 0	12 9	6 6	4 2 1/2
315	1	3700	17 2	20 11	7 4	3 3
315W	1 1/4	4050	17 2	20 11	7 4	4 5
315WS	1 1/4	4300	10 9	14 6	7 4	4 5
316	1	4100	17 2	20 11	7 4	3 3
320	1 1/2	5250	19 4	24 3	8 0	4 0
321	1 1/2	6100	19 4	24 3	8 0	4 0
323	1 1/2	5600	11 7	16 6	8 0	4 0
325	1 1/2	4250	17 2	20 11	8 11	3 3
327	1 3/4	5900	19 4	24 3	8 0	4 7 1/2
328	1 3/4	6400	11 7	16 6	8 0	4 7 1/2
334	2	6700	19 10	24 10	8 1	4 9
330	2	12000	21 3	26 0	8 11	4 9
330X	2	14000	21 3	26 0	8 11	4 9
333	2	12500	13 0	17 9	8 11	5 2
333X	2	13000	13 0	17 9	8 11	5 2
336	2 1/2	16000	21 3	25 0	8 11	5 2
340	3	11000	22 3	27 0	9 1	6 1

BLAW-KNOX DIRECT REEVED TYPE SINGLE LINE BUCKETS

Size No.	Rating, cu. yd.	Weight, lb.	Operating headroom, ft. in.	Scoop spread open, ft. in.	Width outside, ft. in.
303	3/8	1600	5 2	4 10	2 9
304	1/2	2100	5 10	4 4	3 5
308	1 1/2	2350	6 7	5 1	3 0
312	3/4	2950	7 6	6 6	3 2
314	3/4	2900	6 8 1/2	5 2	3 11
312W	1	3350	7 6	6 6	4 2 1/2
317	1	3800	9 2	7 4	3 3
317W	1 1/4	4150	9 2	7 4	4 5
318	1	4200	9 2	7 4	3 3
322	1 1/2	5300	9 3	8 0	4 0
324	1 1/2	6200	9 3	8 0	4 0
326	1 1/2	4350	9 5	8 11	3 3
329	1 3/4	6000	9 3	8 0	4 7 1/2
335	2	6825	10 4	8 1	4 9
332	2	9600	11 9	8 11	4 9
342	3	11200	11 10	9 1	6 1

BLAW-KNOX BULL WHEEL BUCKETS With Low Headroom for Easy Rehandling

Size No.	Rating, cu. yd.	Weight, lb.	Max. height, ft. in.	Open length, ft. in.	Width, ft. in.	Cable over-haulage, ft. in.
220	1	3750	7 5	8 0	3 5	14 9
226	1 1/2	3900	6 11	7 2	4 9	12 0
230	2	4850	7 8	7 7	5 0	12 8
233	2 1/2	6100	9 1	8 9	5 0	15 6
235	3	6800	9 1	8 9	5 11	15 6
240	4	11000	10 9	11 9	6 1	23 0
245	5	11000	11 10	13 2	6 1	25 9
250	6	12000	12 0	12 3	5 1	22 3

LARGE HEAVY DUTY DREADNAUGHT BUCKETS FOR STEEL MILL SERVICE

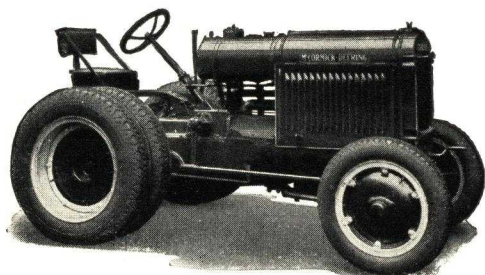
Size No.	Plate line capacity, cu. ft.	Deck covering area, cu. ft.	Wt., lb.	Max. height, ft. in.	Open length, ft. in.	Width, ft. in.	Line to reeve open bucket, ft. in.	Cable over-haulage, ft. in.
741	95.5	57.4	10000	12 10	9 10	5 4	53	534 9
731-H	85.0	48.6	11000	13 2	10 3	4 9	66	944 9
735-H	103.4	55.0	15000	14 0	11 0	5 0	58	638 0
745	136.0	66.0	17000	15 6	12 0	5 6	64	042 0
645	131.0	62.0	18810	15 1	11 3	5 7	60	1038 5
755	198.0	89.0	25500	17 2	13 5	6 7	68	043 0

INTERNATIONAL HARVESTER COMPANY OF AMERICA

(Incorporated)

Industrial Tractors, Power Units, Motor Trucks

606 South Michigan Avenue, CHICAGO, ILL.



McCormick-Deering Model 20 Industrial Tractor

A prominent member of the popular McCormick-Deering industrial tractor family. All three are available with single and dual solid rubber tires, single and dual pneumatic tires, and steel wheels with lugs

Industrial Tractors

McCormick-Deering Models 20, I-30, and 30 Industrial Tractors supply power through drawbar, belt pulley, and side and rear power take-off. As a result they meet the many and varied mobile power needs of industry. They are powered by heavy-duty, 4-cylinder valve-in-head engines with ball-bearing crankshaft, removable cylinders and many other distinctive McCormick-Deering features. That these industrial tractors have stood the test of exacting industrial requirements is evidenced by their popularity and ever-expanding field of operation. They are used in great numbers in every branch of commercial activity from road building and maintenance to manufacturing, wherever economical mobile power is required.

Crawler Tractors

The two McCormick-Deering TracTracTors with positive-grip tracks provide low cost power for many industrial, commercial and construction uses. The TracTracTors, like the industrial tractors and power units, are McCormick-Deering construction throughout.

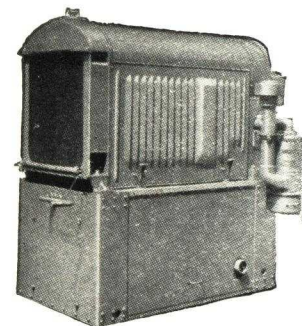
They are the most accessible crawler tractors built—the steering clutches and steering brakes can be inspected, adjusted and replaced without disturbing the tracks, track frames or driving sprockets. The T-20 TracTracTor develops 24 horsepower on the drawbar and 31 horsepower on the belt. The T-40 develops 44 horsepower on the drawbar and 51 horsepower on the belt.

Industrial Power Units

McCormick-Deering power units are available in three sizes—Model 200, P-30 and Model 300, developing 25 to 40 horsepower. The engines are the same as in the McCormick-Deering Models 20, I-30, and 30 Industrial Tractors combined with base mounting, control panel, clutch, and belt pulley.

McCormick-Deering Model 300 Power Unit

Models 200 and P-30 are similar in construction. These powerful units deliver power through belt, gear, chain drive, or direct connection



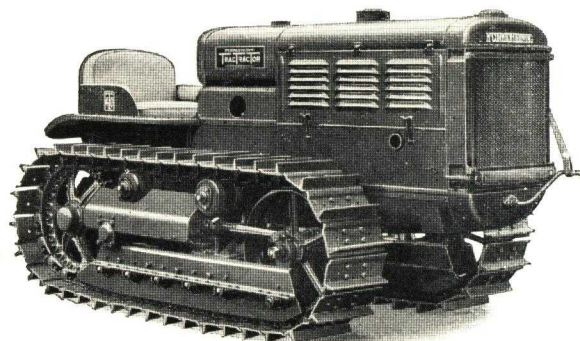
McCormick-Deering Power

Whether in the form of industrial tractor, TracTracTor, or industrial power unit, McCormick-Deering power has been accepted as the standard power for all types of equipment. More than 100 manufacturers are building equipment for the application of McCormick-Deering power. This includes shovels, clam shells, bulldozers, excavators, ditchers, scrapers, road rollers, scarifiers, sweepers, snow plows, logging equipment, cranes, locomotives, and all forms of equipment, operating from the drawbar.

The various units of the tractor such as engine, clutch, transmission, etc., can be removed separately without disturbing adjacent units. All working parts are thoroughly protected from dust and dirt.

McCormick-Deering Service

This service is available through more than 100 Company-owned branches throughout the United States and Canada, scores of distributors, and thousands of dealers where parts and service are immediately available. Catalogue and complete information will be supplied upon request.



The T-40 TracTracTor—Powered by a Heavy-duty Six-cylinder Engine

International Motor Trucks

The International motor truck line includes speed and heavy-duty models in a variety of wheelbases and capacities for every hauling need. There are eleven speed truck models in twenty-nine wheelbases and four heavy-duty models in eighteen wheelbases. Bodies,

hoists, and attachments of all kinds for every type are quickly available. Prompt service is assured through 184 Company-owned branches located in the principal cities of the United States and Canada, and established International truck dealers at other convenient points.

ESTABLISHED 1897

MARKET FORGE COMPANY

Manufacturers of Material Storage and Handling Equipment
EVERETT, MASS.

BRANCH OFFICES

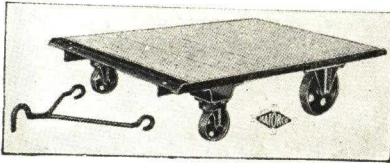
ATLANTA, GA. BALTIMORE, MD. CHICAGO, ILL. CINCINNATI, OHIO DETROIT, MICH. HOUSTON, TEX.
NEW YORK, N. Y. LOS ANGELES, CAL. PHILADELPHIA, PA. PITTSBURGH, PA. ST. LOUIS, MO.

Products

TRUCKS, TRAILERS, SKIDS, BARREL RACKS, STEEL STORAGE RACKS, CASTERS, WHEELS, PLATFORMS and WORK TABLES.

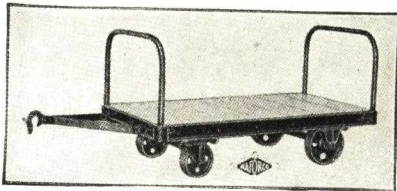
"Maforco" Equipment is the result of over 30 years constant contact and study of the ever changing requirements of industry.

Our Engineering Department is ready to co-operate without obligation on your part.



Live Skid and Trailer No. 370

Steel bound throughout. Mounted on two swivel and two stationary casters. Top of wood or steel. Furnished with or without trailing feature. In sizes, capacities and clearances to meet requirements



Trailer No. 365

Steel frame, oak top. Mounted on 10-in. steel swivel casters and 12-in. broad face cast steel wheels.

Stake pockets on ends and sides. Equipped with Hyatt roller bearings and Alemite lubrication.

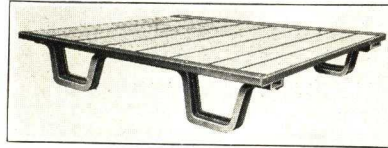
Racks as shown or with one or two cross bars.

Standard size, 3x6 ft.



Heavy Duty Four-wheel Steer Trailer No. 368

4-in. channel frame with steel top. Mounted on steel wheels with 16x3½-in. pressed-on rubber tires. Equipped with Hyatt roller bearings and Alemite lubrication. Platform height, 21 in. Capacity, 8000 lb. Sizes, 2x6 ft. to 4x8 ft.

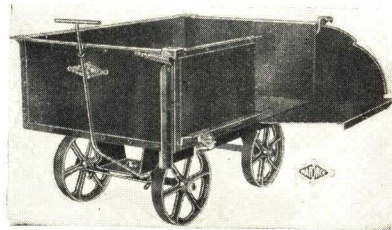


Skid No. 480

Steel bound throughout—unusually strong and rugged—mounted on continuous 3-in. channel legs.

Top of wood or steel.

Sizes, capacities and clearances to suit requirements



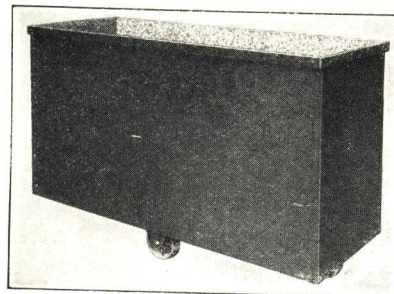
Coal Cars Nos. 346, 347, 348 and 349

"Maforco" hinges eliminate crevices between body and side in both these coal cars. Furnished with one or two drop sides. Drop sides are full length of one side. Illustration shows position when door is open and when closed. Wheels equipped with roller bearings and Alemite lubrication.

The sizes listed below are carried in stock; other sizes can be made to order

DIMENSIONS, CAPACITIES, ETC., COAL CARS NOS. 346, 347, 348 AND 349

No.	Inside body dimensions, in.			Coal capacity		Wheel base, in.	Diam. by face of wheels, in.	Weight, lb.
	Length	Width	Depth	Cu. ft.	Lb.			
346	54	30	13	10	500	30	14x21½	390
347	60	36	18	20	1000	34	16x2½	480
348	66	40	18	30	1500	38	16x3	710
349	72	40	24	40	2000	38	16x3	830



Mill Truck No. 215

We furnish all sizes of steel box trucks for handling bulk material of every description

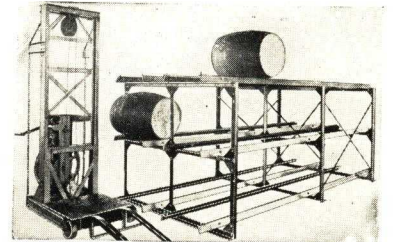


The "Haul-Mark" of Quality



End Dump Truck No. 450

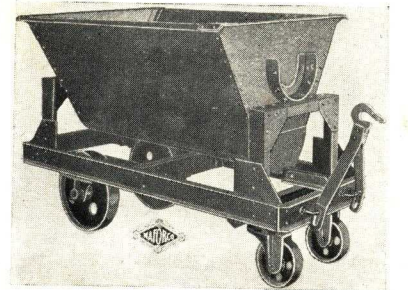
Pick-up trailer for carrying talc, soapstone, earth, sand, gravel, ashes, etc. Any size to suit requirements



Barrel Racks and Tying Machines

Barrel racks furnished 2 to 6 tiers high, any width or length. Built on unit system. Easily set up or relocated.

Tying machines manually or electrically operated



Side Dump Trailer No. 460

Furnished with either fifth wheel or caster type steering equipment.

Regular stock in 18, 27, 36 or 45-cu. ft. capacity; special sizes made to order



No. 360



No. 350

Complete Line of Casters and Wheels

All sizes, heavy duty types from 4 to 12 in. carried in stock. Equipped with roller bearings and Alemite lubrication.

All sizes of wheels from 4 to 24-in. diameters carried in stock.

Write for our caster and wheel catalogue

POWER TRANSMISSION EQUIPMENT

BELTING

DRIVES

CLUTCHES

BEARINGS

GEARING

WIRE ROPE AND CABLE

THE GWILLIAM COMPANY

TELEPHONE
MAIn 4-2644

Ball and Roller Bearings
360 Furman Street, BROOKLYN, N. Y.

Types of Bearings

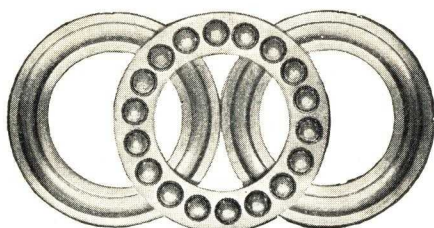
BALL THRUST BEARINGS WITH FLAT RACES.
BALL THRUST BEARINGS WITH GROOVED RACES.
JOURNAL ROLLER BEARINGS.
ROLLER THRUST BEARINGS.
SPECIAL BEARINGS made to order from customer's sketch or sample.
Send for a complete catalogue.

Bearings Carried in Stock

We endeavor to maintain a representative stock of a large number of sizes in the various types for emergency and maintenance requirements.

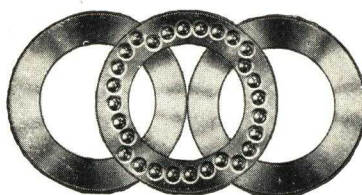


THRUST BEARINGS



Type GB

Ball Thrust Bearings with Grooved Races
Suitable for higher speeds and greater loads than the flat race type illustrated at the right



Type TC

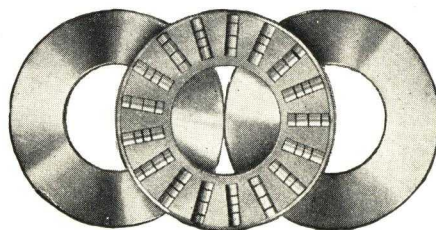
Ball Thrust Bearings with Flat Races
Suitable for light loads at moderate speeds. The balls are staggered or placed in spirals to distribute the load over the maximum surface of the race to prevent tracking



Type PH

With Outside Retaining Band

For heavy loads at slow speeds. No cage or separator is used, permitting the use of the maximum number of balls. The band holds the parts together as a unit



Type RT

Roller Thrust Bearings

This type of bearing is specially suited for extremely heavy loads at slow speeds

In addition to the Standard dimension bearings listed at the right we are prepared to furnish intermediate and larger sizes, made to order in any quantity—one bearing or one thousand.

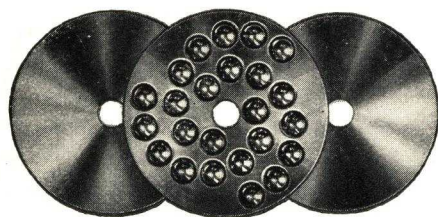
STANDARD THRUST BEARINGS

Note: The bearing numbers refer to all four types shown at the left. When ordering or addressing an inquiry please prefix the letter symbol before the number desired. For example, use RT5 for a No. 5 Roller Thrust Bearing— $\frac{3}{4}$ -in. shaft.

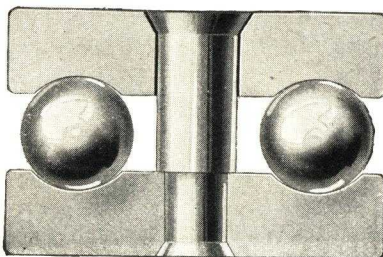
Bearing No. (See note above)	Shaft diam., in.	Outside diam., in.	Thickness, in.
5	$\frac{3}{4}$	$1\frac{1}{2}$	$\frac{5}{8}$
6	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
7	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
8	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
9	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
10	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
11	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
12	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
13	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
14	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
15	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
16	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
17	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
18	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
19	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
20	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
21	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
22	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
23	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
24	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
25	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
26	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
27	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
28	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
29	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
30	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
31	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
32	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
33	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
34	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
35	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
36	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
37	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
38	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
39	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
40	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
41	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
42	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
43	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
44	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$
45	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{5}{8}$

STEP BEARINGS

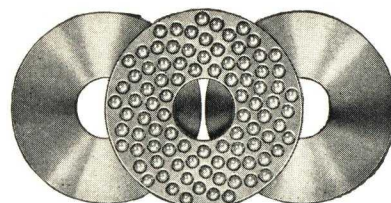
Step Bearings are used principally at the ends of vertical shafts and consist of hardened and ground flat steel plates and bronze retainers containing the



Type BS



Type BSR



Type BS

balls. Usually made on order for any size shaft. May also be made with grooved races and to special design for heavy duty.

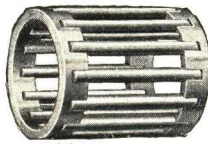
JOURNAL ROLLER BEARINGS

Journal Roller Bearings are designed for radial loads only and made in three distinct types as illustrated at the right, each of which may be used as a complete unit, depending upon the particular application.

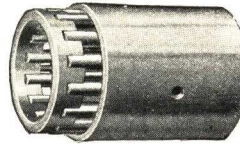
The *rollers* are solid, made of chrome alloy steel, properly hardened and ground to accurate limits, separated and held in place by end rings, which are correctly formed to properly space the rollers. The end rings are held firmly together by stay rods.

The *casings and sleeves* are made of special alloy steel, machined, hardened and accurately ground. *Seamless steel tubings* are used for small sizes and *weldless forgings* for larger sizes.

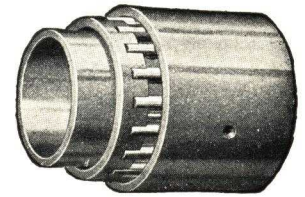
Complete dimensions of all *standard sizes* are listed in our catalogue which will be furnished promptly on request. A large stock is available as illustrated below, to permit prompt shipment of many sizes.



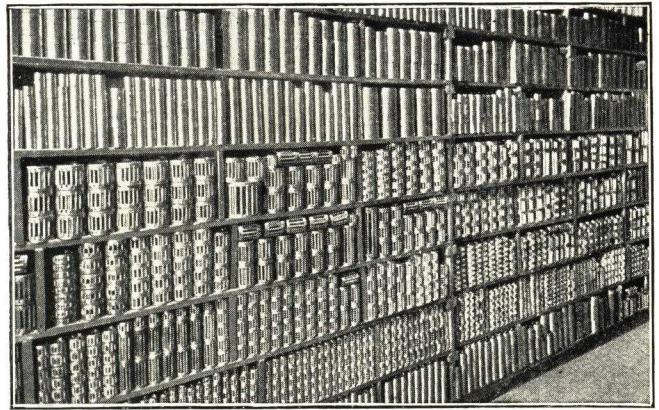
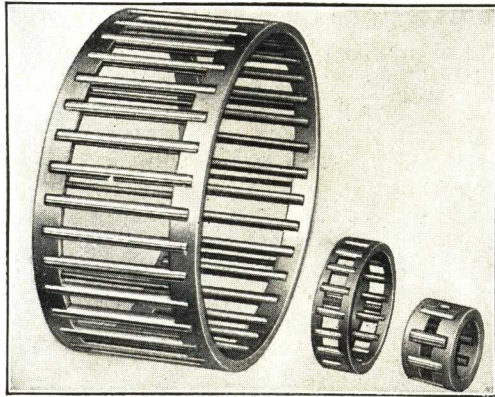
Type JR



Type JRC

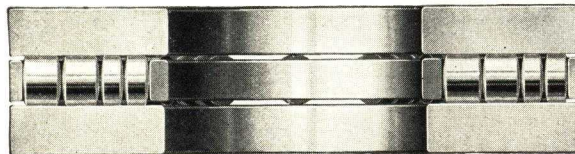
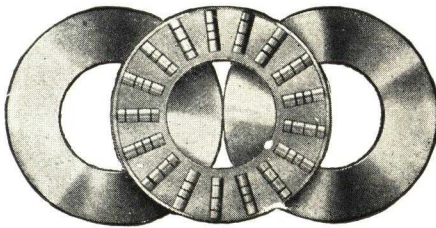
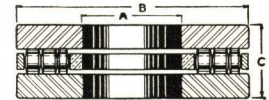


Type JRCS

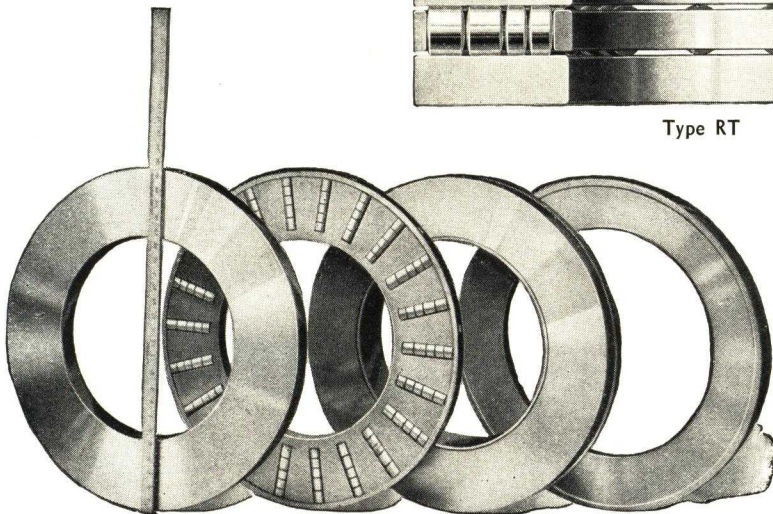


ROLLER THRUST BEARINGS

Roller Thrust Bearings are especially adapted for heavy loads at slow or moderate speeds. The complete bearing shown below consists of two hardened and ground steel plates between which is a bronze cage retaining the steel rollers. The rollers are straight (not tapered), hardened and ground and made in short sections to permit turning readily.



Type RT

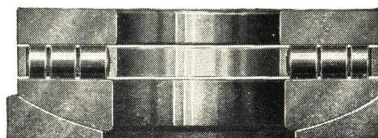


Left:
Extra Heavy Roller
Thrust Bearing
with Leveling
Plates

Right:

Type RXCC with Concave and Convex Leveling Plates
(Concave Plate projecting on sides)

Roller Thrust Bearings can also be furnished with leveling plates as shown at the right, to overcome possible misalignment and insure even distribution of load under unusual conditions of installation. *Made to order only*



HEAVY SERIES

Bearing No.	"A" Shaft diam., in.	"B" Outside diam., in.	"C" Width over all, in.	Diam. Rollers, in.
RT 82	2	6	1 3/8	1 1/8
RT 83	2	7	1 3/8	1 1/8
RT 84	2	8	1 3/8	1 1/8
RT 85	3	6	1 3/8	1 1/8
RT 86	3	7	1 3/8	1 1/8
RT 87	3	8	1 3/8	1 1/8
RT 88	3	9	1 3/8	1 1/8
RT 89	4	7	1 3/8	1 1/8
RT 90	4	8	1 3/8	1 1/8
RT 91	4	9	1 3/8	1 1/8
RT 92	4	10	1 3/8	1 1/8
RT 93	5	8	1 3/8	1 1/8
RT 94	5	9	1 3/8	1 1/8
RT 95	5	10	2	1 3/8
RT 96	5	11	2	1 3/8
RT 97	5	12	2	1 3/8
RT 98	6	9	2	1 3/8
RT 99	6	10	2	1 3/8
RT 100	6	11	2	1 3/8
RT 101	6	12	2	1 3/8
RT 102	7	10	2	1 3/8
RT 103	7	11	2	1 3/8
RT 104	7	12	2	1 3/8
RT 105	7	14	3	1 1/2
RT 106	8	12	3	1 1/2
RT 107	8	14	3	1 1/2
RT 108	8	16	3	1 1/2
RT 109	10	16	3	1 1/2
RT 110	10	18	3 3/4	1 1/2
RT 111	10	20	3 3/4	1 1/2
RT 112	12	18	3 3/4	1 1/2
RT 113	12	20	3 3/4	1 1/2
RT 114	12	24	4 1/2	1 1/2

Intermediate and larger sizes made to order, one or one thousand.

THE NEW DEPARTURE MFG. CO.

DIVISION OF GENERAL MOTORS CORPORATION

Manufacturers of New Departure Ball Bearings

MAIN OFFICE

BRISTOL, CONNECTICUT

PLANTS at BRISTOL and MERIDEN, CONNECTICUT

BRANCHES

DETROIT, MICH., 3044 W. Grand Boulevard
LONDON, ENGLAND, 111 Grosvenor Road, S. W. 1

CHICAGO, ILL., 122 So. Michigan Avenue
SAN FRANCISCO, CALIF., 50 So. Van Ness Avenue

Foreword

New Departure Ball Bearings are built in a wide range of sizes for use in all industries. Several types are procurable, and it is important that the correct type be chosen to meet the conditions of each application. Catalogs and engineering data will be gladly sent on request, which depict New Departures in hundreds of installations. These will be tremendously helpful to the machine designer, but we urge all prospective users, and especially those without anti-friction bearing experience, to submit blueprints to our engineering department for a check-up as to bearing safety factors, seals, lubrication and bearing fits. This service is complimentary and often saves trouble and expense for the machine builder.

Type Descriptions

Single Row—To be used where radial loads predominate. Built in maximum capacity and non-loading groove types, the latter having greater thrust, but less radial capacity than the former. Tolerances in all types are well within limits specified by S.A.E., and where great accuracy is required, such as in delicate instruments and machine tool spindles, New Departure is well equipped to fill your needs, with the Perfex grade.



Single Row Bearings

Shielded—A single row bearing with the addition of a permanently affixed metal shield, which protects the bearing against chips and dirt, and helps to retain non-fluid lubricants.



Shielded Type Bearings

Radax—A non-separable, single row, angular contact bearing having high capacity for radial and one-direction thrust loads. Generally used in pairs for positive location of parts which operate under heavy thrust or combined loads. Can be furnished in three different degrees of angular contact to suit varying load conditions.

Send for Booklet S for more details.

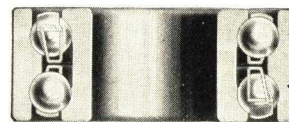


Radax Bearings

NEW DEPARTURE BALL BEARINGS

TRADE-MARK

Double Row—Because of an angular contact design, the New Departure Double Row Bearing has high two-way thrust capacity in addition to a high radial rating. There can be no lag or chatter in shafts supported by this unit, because it is preloaded when assembled. Adjustments are never necessary. In many instances it has taken the place of two separate bearings of other types, thus saving space and cost. A few of the many applications where it is performing with conspicuous success are: speed reducers, drill spindles, portable tools, machine tools, elevators, truck wheels, pulleys, sheaves, and gear boxes.



Double Row Bearings

N-D-Seal—A bearing with an inbuilt seal of felt and metal, to keep out dirt and to retain lubricant. Built only in the smaller sizes, it is very popular with builders of conveyors, motors, vacuum cleaners, fans, portable tools, household appliances and scores of like devices. Charged with lubricant at delivery, it requires no further attention of this sort for from two to five years. For the user, it simplifies machining, speeds up assembly, promotes cleanliness and reduces the number of small closure parts.

Booklet N will tell you more about it.



N-D-Seal Type Bearings

Magneto—A separable type bearing for small devices such as magnetos, fans and fractional horse-power motors. Usually mounted in pairs.



Magneto Type Bearings

Quality

When it comes to bearings, engineers generally agree that quality is more important than price. That is why New Departure raceways are forged; why electric furnace steel is used; why balls and raceways are hardened clear through. And even though New Departure quality has no superior, a corps of research engineers works continuously in our laboratory, looking for methods and materials that will give these sturdy bearings ever greater endurance and strength.

RADAX, SINGLE ROW AND DOUBLE ROW BEARINGS

Radax angular contact			Single row radial				Double row type 5000 angular contact	Bore		Outside diameter		Width single row radax shielded		Width of double row only		List price *See note	List price type 7000 only
			Single row type 1000	Single row type 3000	Shielded bearings series 7200- 7300	Shielded bearings series 7500- 7600											
Type 0	Type 20000	Type 30000						Mm.	Inch	Mm.	Inch	Mm.	Inch	Mm.	Inch		
0200			1200 1300	3200 3300		7500 7600	5200 5300	10	.3937	30 35	1.1811 1.3780	9 11	.3543 .4331	14.29 19.05	$\frac{9}{16}$ $\frac{3}{4}$	\$ 1.70 2.10	\$ 1.80
0201			1201 1301	3201 3301		7501	5201 5301	12	.4724	32 37	1.2598 1.4567	10 12	.3937 .4724	15.88 19.05	$\frac{5}{8}$ $\frac{3}{4}$	1.80 2.30	1.90
0202			1202 1302	3202 3302	7302	7502 7602	5202 5302	15	.5906	35 42	1.3780 1.6535	11 13	.4331 .5118	15.88 19.05	$\frac{5}{8}$ $\frac{3}{4}$	1.90 2.50	2.00 2.60
0203 0303			1203 1303	3203 3303	7303	7503 7603	5203 5303	17	.6693	40 47	1.5748 1.8504	12 14	.4724 .5512	17.46 22.23	$\frac{11}{16}$ $\frac{7}{8}$	2.10 2.90	2.20 3.00
0204 0304 0404	20204 20304 20404	30204 30304 30404	1204 1304 1404	3204 3304	7304	7504 7604	5204 5304	20	.7874	47 52 72	1.8504 2.0472 2.3446	14 15 19	.5512 .5906 .7480	20.64 22.23	$\frac{13}{16}$ $\frac{7}{8}$	2.60 3.50 5.20	2.70 3.60
0305 0405	20205 20305 20405	30205 30305 30405	1205 1305 1405	3205 3305	7305	7505 7605	5205 5305	25	.9843	52 62 80	2.0472 2.4409 3.1496	15 17 21	.5906 .6693 .8268	20.64 25.40	$\frac{13}{16}$ 1	3.00 4.10 6.00	3.10 4.20
0206 0306 0406	20206 20306 20406	30206 30306 30406	1206 1306 1406	3206 3306	7206 7306	7506 7606	5206 5306	30	1.1811	62 72 90	2.4409 2.8346 3.5433	16 19 23	.6299 .7480 .9055	23.81 30.16	$\frac{15}{16}$ $\frac{13}{16}$	4.00 5.20 7.30	4.10 5.35
0207 0307 0407	20207 20307 20407	30207 30307 30407	1207 1307 1407	3207 3307	7207 7307	7507 7607	5207 5307	35	1.3780	72 80 100	2.8346 3.1496 3.9370	17 21 25	.6693 .8268 .9843	26.99 34.93	$\frac{11}{16}$ $\frac{13}{16}$ $\frac{13}{8}$	4.60 6.00 8.70	4.75 6.20
0208 0308 0408	20208 20308 20408	30208 30308 30408	1208 1308 1408	3208 3308	7208 7308	7508 7608	5208 5308	40	1.5748	80 90 110	3.1496 3.5433 4.3307	18 23 27	.7087 .9055 1.0630	30.16 36.51	$\frac{13}{16}$ $\frac{13}{16}$	5.40 6.80 10.50	5.60 7.05
0209 0309 0409	20209 20309 20409	30209 30309 30409	1209 1309 1409	3209 3309	7209 7309	7509 7609	5209 5309	45	1.7717	85 100 120	3.3465 3.9370 4.7244	19 25 29	.7480 .9843 1.1417	30.16 39.69	$\frac{13}{16}$ $\frac{13}{16}$	6.00 8.50 13.00	6.20 8.75
0210 0310	20210 20310 20410	30210 30310 30410	1210 1310 1410	3210 3310	7210 7310	7510	5210 5310	50	1.9685	90 110 130	3.5433 4.3307 5.1181	20 27 31	.7874 1.0630 1.2205	30.16 44.45	$\frac{13}{16}$ $\frac{13}{16}$ $\frac{13}{8}$	7.00 10.00 16.00	7.25 10.30
0211 0311	20211 20311 20411	30211 30311 30411	1211 1311 1411	3211 3311	7211 7311	7511	5211 5311	55	2.1654	100 120 140	3.9370 4.7244 5.5118	21 29 33	.8268 1.1417 1.2992	33.34 49.21	$\frac{13}{16}$ $\frac{13}{16}$	8.00 12.40 19.00	8.25 12.80
0212 0312	20212 20312 20412	30212 30312 30412	1212 1312 1412	3212 3312	7212 7312		5212 5312	60	2.3622	110 130 150	4.3307 5.1181 5.9055	22 31 35	.8661 1.2205 1.3780	36.51 53.98	$\frac{13}{16}$ $\frac{13}{16}$ $\frac{23}{8}$	9.30 15.50 22.90	9.60 16.00
0213 0313	20213 20313 20413	30213 30313 30413	1213 1313 1413	3213 3313	7213 7313		5213 5313	65	2.5591	120 140 160	4.7244 5.5118 6.2992	23 33 37	.9055 1.2992 1.4567	38.10 58.74	$\frac{13}{16}$ $\frac{23}{8}$	11.50 19.10 29.60	11.85 19.80
0214	20214 20314 20414	30214 30314 30414	1214 1314 1414	3214 3314	7214 7314		5214 5314	70	2.7559	125 150 180	4.9213 5.9055 7.0866	24 35 42	.9449 1.3780 1.6535	39.69 63.50	$\frac{13}{16}$ $\frac{23}{8}$	12.50 22.50 39.50	12.90 23.60
0215 0315	20215 20315 20415	30215 30315 30415	1215 1315 1415	3215 3315	7315		5215 5315	75	2.9528	130 160 190	5.1181 6.2992 7.4803	25 37 45	.9843 1.4567 1.7717	41.28 68.26	$\frac{15}{8}$ $\frac{21}{16}$	13.70 28.00 55.00	
0216	20216 20316 20416	30216 30316 30416	1216 1316 1416	3216 3316			5216	80	3.1496	140 170 200	5.5118 6.929 7.8740	26 39 48	1.0236 1.5354 1.8898	44.45 68.26	$\frac{13}{8}$ $\frac{21}{16}$	16.00 32.20 65.00	
0217	20217 20317 20417	30217 30317 30417	1217 1317 1417	3217 3317			5217	85	3.3465	150 180 210	5.9055 7.0866 8.2677	28 41 52	1.1024 1.6142 2.0472	49.21 73.03	$\frac{13}{16}$ $\frac{23}{8}$	19.80 39.00 75.00	
0218	20218 20318 20418	30218 30318 30418	1218 1318 1418	3218 3318			5218	90	3.5433	160 190 225	6.2992 7.4803 8.8583	30 43 54	1.1811 1.6929 2.1260	52.39	$\frac{21}{16}$	23.00 47.20 85.00	
0219	20219 20319	30219 30319	1219 1319	3219 3319				95	3.7402	170 200	6.929 7.8740	32 45	1.2598 1.7717			28.00 56.00	
0220	20220 20320	30220 30320	1220 1320	3220 3320			5220	100	3.9370	180 215	7.0866 8.4646	34 47	1.3386 1.8504	60.33	$\frac{23}{8}$	36.00 66.00	
	20221 20321	30221 30321	1221 1321	3221 3321				105	4.1339	190 225	7.4803 8.8583	36 49	1.4173 1.9291			42.00 77.00	
	20222 20322	30222 30322	1222 1322	3222 3322			5222	110	4.3307	200 240	7.8740 9.4488	38 50	1.4961 1.9685			47.00 96.00	

*Does not include prices for Type 20000 and 30000 Radax bearings.
Prices upon application.

N-D-SEAL BEARINGS

MAGNETO BEARINGS

Bearing No.	Bore		Diameter		Width		Price
	Mm.	Inch	Mm.	Inch	Mm.	Inch	
N.D. 8	8	.3150	24	.9449	7	.2756	\$1.60
N.D. 10	10	.3937	28	1.1024	8	.3150	1.70
N.D. 12	12	.4724	32	1.2598	7	.2756	1.80
N.D. 13	13	.5118	30	1.1811	7	.2756	1.80
N.D. 15	15	.5906	35	1.3780	8	.3150	1.90
N.D. 16	16	.6299	38	1.4961	10	.3937	2.05
N.D. 17	17	.6693	44	1.7323	11	.4331	2.15
N.D. 20	20	.7874	47	1.8504	14	.5512	2.60
N.D. 25	25	.9843	52	2.0472	15	.5906	3.00

Bearing No.	Bore		Diameter		Width Inch	Price
	Mm.	Inch	Mm.	Inch		
8006	6	.2362				
8007	7	.2756	24	.9449	.406	\$1.80
8008	8	.3150				
8009	9	.3543				
8500	10	.3937	30	1.1811	.500	1.90
8011	11	.4331				
8501	12	.4724	32	1.2598	.500	2.00
8013	13	.5118				
8014	14	.5512				
8502	15	.5906	35	1.3780	.500	2.10
8016	16	.6299				
8503	17	.6693	40	1.5748	.563	2.40
8504	20	.7874	47	1.8504	.625	2.90
8505	25	.9843	52	2.0472	.625	3.30

NORMA-HOFFMANN BEARINGS CORPORATION

MAIN OFFICE AND FACTORY
STAMFORD, CONN., U. S. A.

NEW YORK, N. Y.

PITTSBURGH, PA.

CLEVELAND, OHIO

CINCINNATI, OHIO

DETROIT, MICH.

CHICAGO, ILL.

PRECISION BALL, ROLLER AND THRUST BEARINGS

NORMA-HOFFMANN

The worth of an antifriction bearing is to be measured in terms of its cost per year, or per mile, of service—not by its price. Economy is a matter of performance, not of first cost. Actual records, made under diverse and difficult conditions, constitute the only safe guide in appraising serviceability and true value.

Over a period of 20 years, in every field of industry and engineering, Norma-Hoffmann Precision Bearings have been distinguished for performance above the ordinary, for dependable serviceability, and for high economy long sustained. There is a Precision Bearing for every load, speed and duty. Twelve of the types more commonly used, out of the comprehensive Norma-Hoffmann line, are here pictured and briefly described.

(1) **Open Type Ball Bearings**—Instantly separable into their component parts without the use of tools, thus facilitating mounting, assembly and disassembly.

(2) **Closed Type Radial Ball Bearings**—In a range of metric and inch sizes up to 18½-inch bore; self-contained, non-separable units with deep races, for both radial load and end thrust in either direction.

(3) **Angular Contact Bearings**—Closed, adjustable ball bearings especially adapted for extra heavy thrust load in one direction, as well as radial load.

(4) **Plate (Shielded) Type Ball Bearings**—With one (Type "P") or two (Type "PP") dirt-excluding and grease-retaining labyrinth side plates.

(5) **"7000" Series "Greaseal" Felt-Protected Ball Bearings**—Grease-packed, with dust-and-moisture-proof labyrinth construction; all-steel ball bearings that simplify construction and save machining and assembling costs.

(6) **Double-Row Self-Aligning Ball Bearings**—With an inherent self-aligning feature automatically taking care of misalignment; also furnished with adapter sleeve and nut.

(7) **Standard Cylindrical Roller Bearings**—Heavy-duty, high-speed units for severe radial loads, temporary overloads, shock and vibration; cylindrical rollers, shouldered inner ring, plain outer ring; land-riding balanced solid bronze cage.

(8) **One-Lipped Cylindrical Roller Bearings**—Identical with No. 7 except that outer ring has one lip or shoulder; suitable for shaft location when used in pairs, with lips in outer ring opposed.

(9) **Two-Lipped Cylindrical Roller Bearings**—Non-separable heavy-duty units with two lips or shoulders on outer ring; suitable for shaft location as well as radial load.

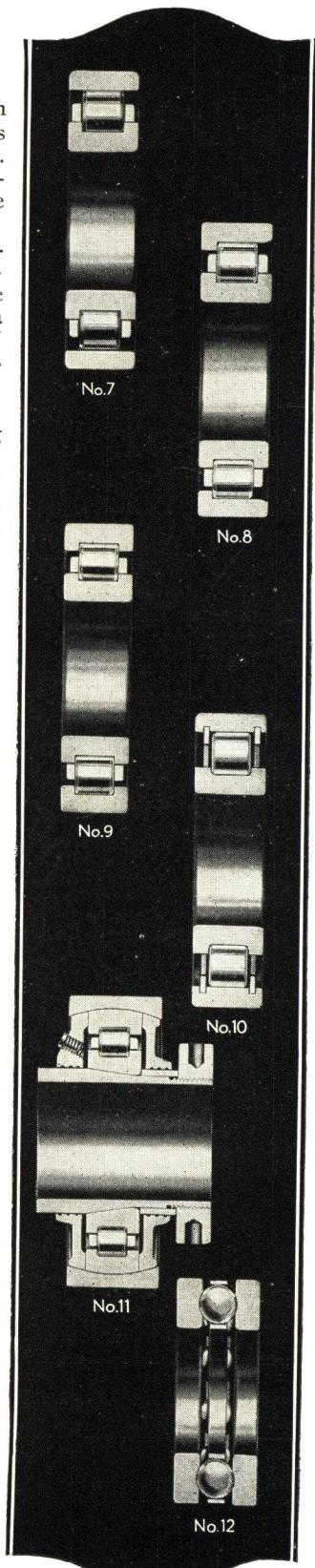
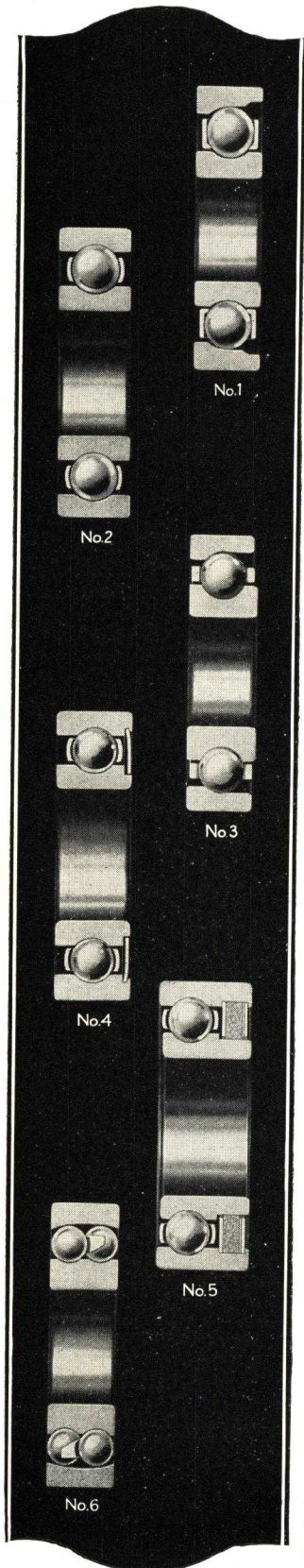
(10) **Full-Roller Type Cylindrical Roller Bearings**—Similar to No. 7 above but self-contained (having retaining rings in outer race) and incorporating no cage; carries maximum number of rollers and has larger load capacity at moderate speeds.

(11) **Self-Aligning Cylindrical Roller Bearings**—Similar to No. 9 above, but with spherical outer ring and grease-retaining, dirt-and-moisture-excluding side plates and adapter sleeve; inherently self-aligning.

(12) **Ball Thrust Bearings**—Single-direction type illustrated; furnished also in double-direction type and with self-aligning seats; a range of types adapted to all thrust conditions.

Engineering Service and Publications

If the utmost of service and economy is to be realized from antifriction bearings, they must not only be carefully chosen for their specific duties as to size and type, but must also be properly mounted and lubricated. To this end, Norma-Hoffmann engineers will be glad to place at your disposal—without obligation—their exceptional experience in bearing applications for practically every purpose. The complete line of Precision Bearings is described and listed in the Catalogue, gladly sent on request.



SKF INDUSTRIES, INC.

40 East 34th Street, NEW YORK, N. Y.

DISTRICT OFFICES IN PRINCIPAL CITIES

Ball and Roller Bearings—Pillow Blocks—Hangers

Throughout every industry the letters SKF are synonymous with ball and roller bearings, pillow blocks and hangers that are built to the highest standards of quality. It is the one outstanding reason why "SKF Performance Takes Preference Over Price" with the leading manufacturers in every line of endeavor for new equipment, as well as for replacements on existing installations.

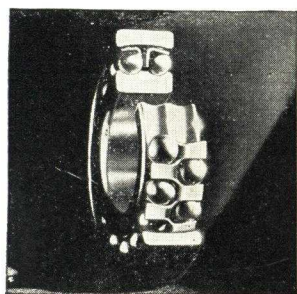
Have you a troublesome plain bearing in your plant? Set the job right once and for all and know what it is to have absolute freedom from bearing problems and keep production schedules uninterrupted by installing SKF Ball or Roller Bearings



in SKF Pillow Blocks. They reduce friction, save power and lower maintenance. It makes little difference how big or small the job may be, huge drive shafts, fans, blowers, or some small equipment with out-board bearings—for every replacement, SKF has the right bearing for the right place. SKF Bearings and Pillow Blocks are made to fit shafts $\frac{5}{8}$ to $1\frac{3}{4}$ inches in diameter.

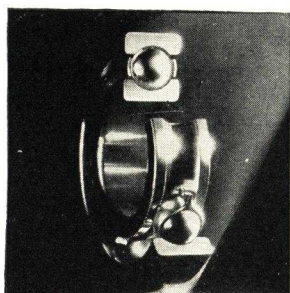
And don't forget your lineshafts. Their performance can be bettered by a change to SKF Self-aligning Ball Bearing Hangers, of which there are today more than 3,000,000 in satisfactory service in varied industries throughout the world.

SKF Ball and Roller Bearings



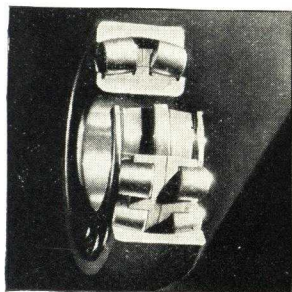
SKF Self-aligning Ball Bearing

Has two rows of balls and the inherent ability of compensating automatically for angular misalignment or shaft deflections



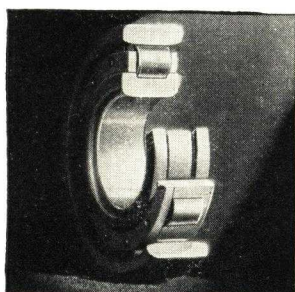
SKF Deep-groove Ball Bearing

Because of its construction will carry radial load, thrust load, or any combination of the two. Made with single and double rows of balls



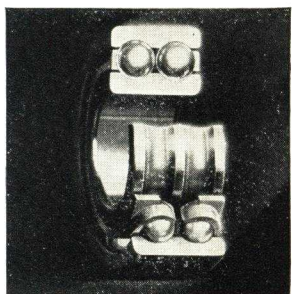
SKF Spherical Roller Bearing

For the brute jobs of industry, designed to meet space limitations where greater compactness for a given capacity is required



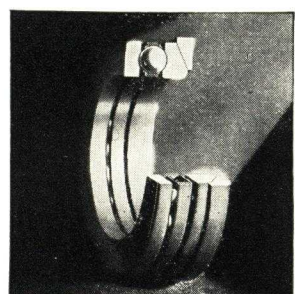
SKF Cylindrical Roller Bearing

Has a single row of cylindrical rollers and is designed essentially to carry radial load only. Made in light, medium and heavy series



SKF Deep-groove Double Row Ball Bearing

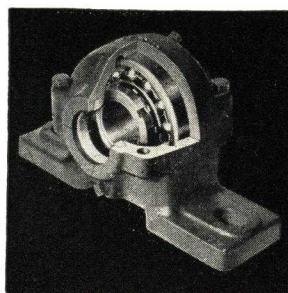
Designed on the same principles as single row deep-groove bearing but provides about twice the capacity



SKF Ball Thrust Bearing—One Direction—Aligning

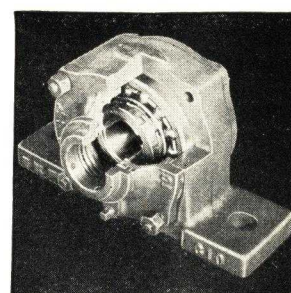
Used for thrust loads only. This is the simplest form of all anti-friction bearings

SKF Pillow Blocks and Hangers



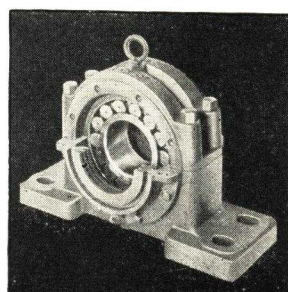
SKF Split Pillow Block

For normal and heavy duty standard applications. Can be furnished to provide for locating the bearing (held type). May be supplied with flingers. Can be provided with one end closed



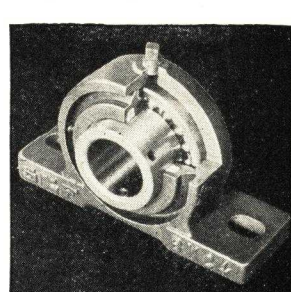
SKF Universal Pillow Block

For the varying and exacting requirements of machine applications. Furnished with end covers, of free or stabilizing types. Can be supplied with flingers where operating conditions warrant



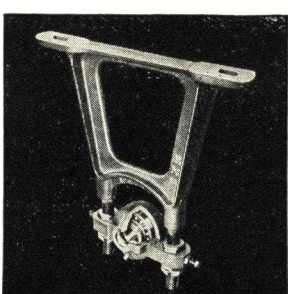
SKF Roller Bearing Pillow Block

For the most severe application in industry. Removable split end covers facilitate assembling. Supplied with flingers. Heavy construction assures ample capacity



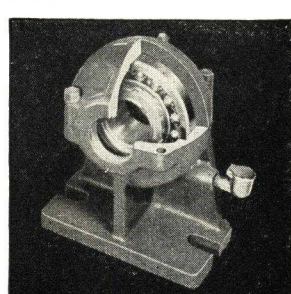
SKF Unit Pillow Block

For light applications where simplicity of installation is desired. In this Pillow Block the "X" or extended inner race bearings are used, provided with set screws for locking to standard shafts



SKF Self-aligning Ball Bearing Hanger

Uses the SKF Self-Aligning Ball Bearing. Easily erected. Effects material savings in power, lubricant and maintenance



SKF Fan Box

For universal use on majority of fans and blowers. Permits easy replenishing of lubricant

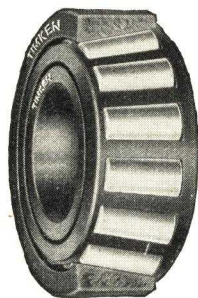
THE TIMKEN ROLLER BEARING COMPANY

Manufacturers of Tapered Roller Bearings
CANTON, OHIO

BRANCH ENGINEERING AND SALES OFFICES IN PRINCIPAL CITIES

Design

The Timken Tapered Roller Bearing consists of three load-carrying elements, the tapered or conical rollers operating between the inner race or tapered cone, and the outer race or tapered cup. True rolling action is assured by making the apexes of the conical surfaces of the cone, cup and roller coincide on the axis of the bearing.



Standard Timken Bearing

The rollers contact against the back rib of the cone in two well-separated areas. For this reason they are positively aligned at all times without guidance by the cage, which merely serves to space the rollers about the cone. This feature, exclusive to Timken Bearings, increases the capacity for all types of loads while greatly reducing friction.

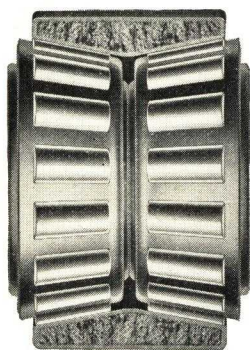
These parts are made of Timken steel, hardened and ground accurately to size. A one-piece pressed steel cage to retain the rolls about the cone completes the bearing.

Advantages of Timken Bearings

Thrust Load—Because of their tapered construction, Timken Bearings meet every possible combination of both radial and thrust load and do so much more efficiently, thoroughly and completely.

Power Saving—On account of the true rolling motion of Timken Bearings, friction, whether resulting from radial load or thrust load, is eliminated. Actual results in every day service show that there is a substantial saving of power resulting directly from Timken installations.

Saving Lubricant—Timken Bearing applications may be enclosed in such a way that there is ample space in the housing for a liberal supply of lubricant. Usually it is not necessary to renew this excepting at very infrequent intervals which results not only in an actual saving of lubricant, but the time required to inspect the application and replenish the supply.

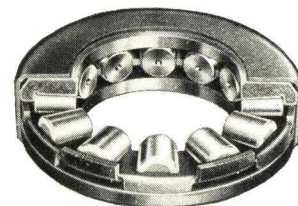


Timken N. A. Type Double Bearing

Elimination of Shaft Wear—All moving contact in Timken Bearings is between the hardened and ground surfaces of the bearings themselves. For this reason there is no motion and consequently no wear either in the hub or on the shaft. For this reason, the initial precision is retained indefinitely.

Engineering Service

Complete technical data is available in the Timken Engineering Journal which covers dimensions, load rating and capacity tables, speed capacity curves, simplified methods of calculating bearing loads, information on closures, fitting practices, assembly and lubrication.



Timken Thrust Bearing

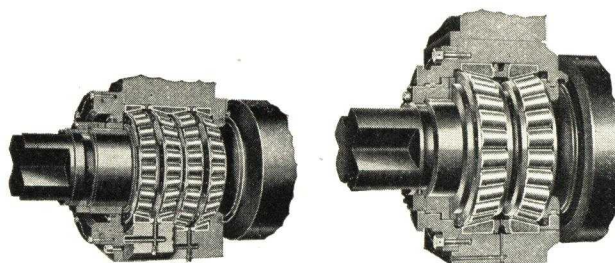
Additional technical information is available showing specific applications of Timken Bearings in

Aeroplanes	Leather working machinery
Amusement devices	Lawnmowers
Automobiles	Locomotives
Bakery machinery	Logging blocks
Blowers	Logging engines
Buscs	Machine tools
Clayworking machinery	Mine cars
Compressors	Motorcycles and side cars
Conveyors	Oil mining equipment
Cranes	Paper mill machinery
Electrical machinery	Printing machinery
Elevators	Pulverizing equipment
Engines	Pumps
Fans	Railway equipment
Farm machinery	Road building machinery
Farm tractors	Rubber machinery
Gear reduction units	Screening equipment
Glass making machinery	Shop or industrial trucks
Grain milling machinery	Steel mill machinery
Hoists	Textile machinery
Household appliances	Trailers
I-beam trolleys	Transmission machinery
Ice making machinery	Trucks
Laundry machinery	Woodworking machinery

All of the above data is available to manufacturers and engineers and will be supplied gladly.

The experience of the Timken Engineering Department is also available on all problems.

This service is confidential and without charge or obligation and is being used continually by leading manufacturers in all industries.



Timken Mill Type Bearings Showing Applications to Steel Mill Roll Necks

WESTERN ENGINEERING & MANUFACTURING CO.

Manufacturers of the Cleveland Friction Clutch

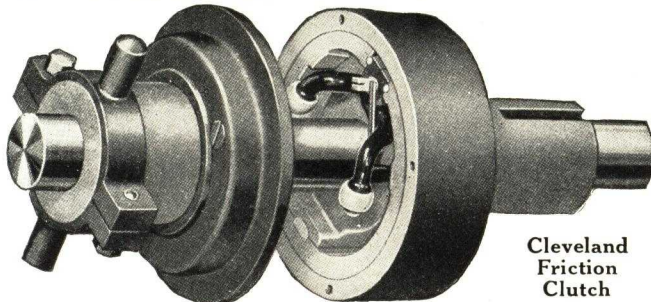
230 No. Michigan Avenue, CHICAGO, ILL.

SHOPS
OSWEGO, N. Y.

BRANCH OFFICE
NEW YORK, N. Y.,
60 E. 42nd St.

Cleveland Friction Clutch

A powerful, simple, dependable, expanding ring, self-oiling clutch, unaffected by dust or moisture, and giving long service under all conditions where a clutch is adaptable. Particularly adaptable for all types of special machines where safety and appearance are important.



Cleveland
Friction
Clutch

Construction—The clutch consists of a combined casing and sleeve, riding free upon the shaft, upon which pulley, gear, sprocket or other similar member is fixed. This casing encloses an expanding ring, making frictional contact with the inner surface of the casing. Powerful mechanism for expanding the ring consists of two floating fingers and floating pins located within ring. Other parts are driving member keyed to shaft, oil and dust tight cover enclosing clutch mechanism, and hardened cone-shaped sleeve, fitting loosely on shaft and projecting through the cover so that it can be forced between the floating fingers by a shifter yoke, hand wheel or other suitable means.

The cut-off coupling is similar except that the casing is keyed to one shaft and the driving member to the other.

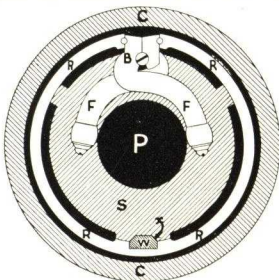


Fig. 1. Ring Unexpanded and Disengaged from Friction Contact with Casing

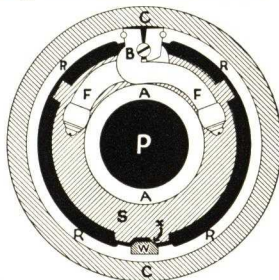


Fig. 2. Ring Expanded into Complete Engagement with Casing

Exaggerated Diagram of Cleveland Mechanical Action

A—Actuating cone F-F—Floating fingers S—Driving spider
B—Adjustment screw P—Shaft W—Torque wedge
C—Casing R—Friction ring

Operation—Inserting cone A between "floating" fingers F-F forces them apart and expands friction ring R into complete engagement with casing C. As ring R expands it loses contact with the driving spider S, except along the surface in contact with the torque wedge at x. When load is applied, contact surfaces of the spider and torque wedge slide in opposite directions and wedge spider and torque wedge together, so that the heavier the load the tighter the clutch holds.

In all sizes above No. 1, adjustment for wear is made by a single adjustment screw, B.

STANDARD DIMENSIONS FOR CLEVELAND CLUTCHES

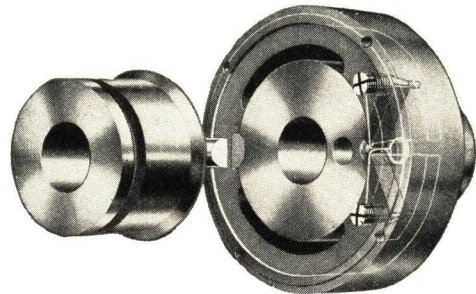
No.	Hp. at 100 r.p.m.	Range of bores, in.		Standard sleeves, in.		Standard over all, in.	Outside diam., in.
		Standard	Maximum	Diam.	Length		
1	2	3/4 to 1 1/16	1 1/2	2 1/16	3 5/8	8 11/16	5 1/8
2	6	1 to 1 3/4	2 1/8	2 7/8	6 1/4	13 3/8	7 1/8
3	10	1 3/8 to 2	2 1/8	3 3/8	6 1/4	14 13/16	8 3/4
4	15	1 5/8 to 2 1/8	3 1/8	3 11/16	6 1/2	16 3/8	10 7/8
5	25	1 5/8 to 2 1/8	4	4	8	19 7/8	13 3/8
6	35	2 1/8 to 2 11/16	4 7/8	4 9/8	9 1/4	23 1/2	15 3/8
7	50	2 1/2 to 3	4 13/16	5 5/8	10	26 3/8	17 3/8
8	65	2 13/16 to 3 1/2	5 11/16	5 11/8	10 3/4	30	19 3/8
9	80	3 1/8 to 4	6 1/8	6 1/8	11	29 13/16	21
10	100	3 1/8 to 4	7	6 1/2	11 1/2	31 3/8	23
11	125	3 11/16 to 4 1/4	7 15/16	6 3/4	12	32 3/4	25 1/4

Note: Bronze bushing recommended on speeds over 250 r.p.m. Clutch can be adapted to meet almost any special condition.

Type "A" High Speed Friction Clutch

Adaptable to all types of machines and designed to operate at high speeds.

Fully enclosed, self-oiling, all metal clutch of expanding ring type. Friction ring and casing made of semisteel, which is



Type "A" High Speed Friction Clutch
Cover removed

particularly well suited for friction surfaces on account of its close grain. Every part carefully standardized, accurately made and balanced. Conservatively rated for normal transmission service. Ideal for standard equipment, on account of sturdy simplicity and small space required.

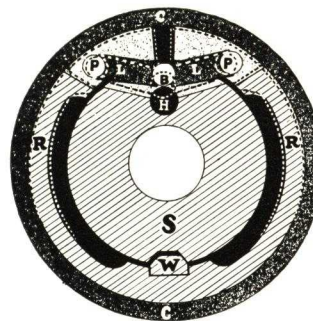


Diagram of Type "A" Clutch

wedging ring R against casing C. The greater the load the firmer the contact between ring and casing.

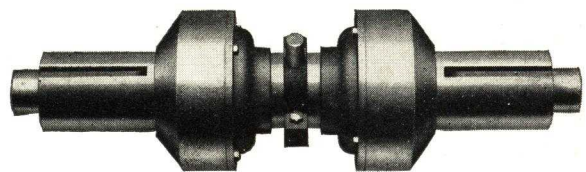
Operation—Diagram shows friction ring in complete contact with casing C. Withdrawal of actuating wedge H permits spring tension of ring R to disengage contact surfaces and force levers L-L and steel ball B into position indicated by dotted line. Insertion of wedge H raises ball B and straightens out lever L-L, pushing back ring fulcrum points P-P and expanding ring. Torque caused by carrying load causes driving spider S to slide up the slope of torque wedge W, thus wedging ring R against casing C. The greater the load the firmer the contact between ring and casing.

STANDARD DIMENSIONS OF TYPE "A" CLUTCHES

No.	Hp. at 100 r.p.m.	Range of bores, in.		Standard sleeves, in.		Standard over all, in.	Outside diam., in.
		Standard	Maximum	Diam.	Length		
A	3/4	1 5/8	1 1/8	1 3/4	1 11/16	4 15/16	4 1/8
1A	3	3/4 - 1 1/8	1 11/16	2 3/8	3 3/8	7 15/16	5 1/8
2A	6	1 - 1 3/4	2 1/8	2 7/8	6 1/4	11 13/16	7 1/8

Cleveland Double Clutch

The Cleveland double clutch is particularly well adapted to countershafts or other service. Unsurpassed for simplicity, economy of space and dependability.



Cleveland Double Clutch

As shown above, it is practically only a doubling up of the single clutch and is furnished at the price of two single clutches of the same size.

BOSTON GEAR WORKS INC.

MAIN OFFICE AND FACTORY
NORTH QUINCY, MASS.

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Boston Gear Works Inc., 106 Brookline Ave. Phone—Commonwealth 3375
BUFFALO, N. Y., Root, Neal & Company, 178-180 Main Street. Phone—Jefferson 2540
CHICAGO, ILL., Boston Gear Works Inc., 955 W. Washington Blvd. Phone—Monroe 5973-4-5
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CLEVELAND, OHIO, Boston Gear Works Inc., 211 St. Clair Avenue, N. W. Phone—Main 5140
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MILWAUKEE, WIS., The Western Iron Stores Co., 319-331 East Clybourn Street. Phone—Marquette 2123
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NEW YORK, N. Y., Boston Gear Works Inc., 151 Lafayette Street. Phone—Canal 6-1150
NORTH QUINCY, MASS., Boston Gear Works Inc. Phone—President 0400
OAKLAND, CAL., C. W. Marwedel, 11th and Alice Streets. Phone—Temple Bar 3800
PHILADELPHIA, PA., Boston Gear Works Inc., 11th and Arch Streets. Phones—Bell: Walnut 3688-3689; Keystone: Race 5678
PITTSBURGH, PA., Somers, Fittler & Todd Co., 313-327 Water Street. Phone—Court 4860
PROVIDENCE, R. I., Machine Parts Corporation, 271 Washington Street. Phone—Plant 2824
ST. LOUIS, MO., Colcord-Wright Machinery & Supply Company, 1223-1229 No. Broadway. Phone—CE-6970
SAN FRANCISCO, CAL., C. W. Marwedel, 76 First Street. Phone—Douglas 4180
SPRINGFIELD, MASS., Boston Gear Works Inc., 369 Plainfield Street, P.O. Box No. 288. Phone—Springfield 3-4716
SYRACUSE, N. Y., Syracuse Supply Company, 314 W. Fayette Street. Phone—Syracuse 2-9231
WORCESTER, MASS., W. M. Steele Co., 98-100 Beacon Street. Phone—3-6170

Products and Service

For nearly fifty years the BOSTON GEAR WORKS INC. has manufactured products of the highest quality and workmanship. Millions are now in use the world over in many different types of high grade machinery.

Over a million Boston Gear Products, comprising types and sizes for nearly every purpose, are carried in stock at the various Service Stations listed above, ready for *immediate shipment*.

Boston Gear Products consist of: Gears; Speed Reducers; Roller and Inverted Tooth Chain Drives; Shaft Supports; Pillow Blocks; Pulleys; Universal Joints; Shaft Couplings; Bushings; Washers; Ball Bearings, etc.

BOSTON GEARS

(Reg. U. S. Pat. Off.)

The General Catalogue contains a complete list of specifications and prices relative to all Boston Gear Products. Supplementary catalogues for the different products are also issued.

The BOSTON GEAR WORKS INC. is exclusive distributor in the United States of America for Renold and Coventry Products, including transmission chain, conveying chain and mortise gear.

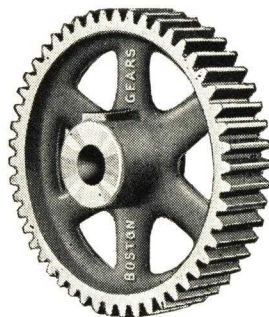
The advice of the Boston Gear Works Engineering Department is always available in connection with Boston Gear Products.

Speed Reducers

Timken Bearing Equipped Speed Reducers are available *from stock* in horsepower up to twenty, and in ratios up to 4000 to 1. Right angle, vertical and parallel types.

The Boston Motorized Speed Reducer is available in various sizes, horsepower and speeds. All models are equipped with General Electric Co. motors. Other makes of motors may also be used economically, but only when the complete assembly is produced in large quantities.

Submit your specifications for recommendations.



Gears

Gears for every type of gear drive, comprising a wide range of types and sizes in cast iron, steel and bronze, are available *from stock* in the following types: spur, internal, helical, bevel, miter, worm, spiral. Spur gears are also available in non-metallic form. Special catalogues issued on the above.

Doehler Die-Cast Stock Gears, in a wide range of types and sizes, are now obtainable exclusively through the BOSTON GEAR WORKS INC. A special catalogue is issued.

Chain Drives

(Inverted tooth and roller types)

Drives for any horsepower up to one hundred may be had *from stock*. Drives of greater horsepower than one hundred are available for prompt shipment.

Types include: light duty ladder; single, double and triple roller; and inverted tooth. Special catalogues are issued on the above. Other types of chain include conveying and mortising.



THE CLEVELAND WORM & GEAR COMPANY

Manufacturers of "Cleveland" Worm Gear Reduction Units

3262 East 80th Street, CLEVELAND, OHIO

The Company

Since its organization 20 years ago, THE CLEVELAND WORM & GEAR COMPANY has concentrated solely on the manufacture of worm gear speed reduction units and worm gearing for automotive drives. The company was the first in this country to manufacture automotive worm gearing in commercial quantities and, today, operates the only plant devoted exclusively to worm gearing.

Design of Units

Worm gearing is inherently simple. A single "Cleveland" worm and worm gear will supply reduction ratios up to 100:1. Shafts turn on antifriction bearings. Worms and worm gears are aligned to 1/1000th of an inch accuracy. Unusual strength is built into the reinforced housings. Lubrication is positive.

Workmanship

Skilled and closely supervised. Machine operations are held to limits unusual in worm gear production by means of a complete system of gauges, jigs and fixtures.

Dependable Operation

Many "Cleveland" Units run for years without having the housing cover removed. Most owners find periodic inspection unnecessary. Unit rating provides ample safety factor against heavy unexpected shock loads. Nothing short of accident destroying unit will cause sudden failure.

Application

As there are more than 20,000 "Cleveland" drives in service, all ratings are proven by experience. All recommendations, therefore, are thoroughly dependable for continuity of service.

Types of Units Manufactured

Horizontal Drives—For Direct Connected Loads—Type A T (worm below gear), Type RT (worm above gear).

Vertical Drives—Type V T (gear shaft extends upward), Type V D (gear shaft extends downward).

For Great Reductions in Speed—Type D (double reduction unit).

For Overhung Loads—Type A H (worm below gear), Type R H (worm above gear).

Note: For each size of the foregoing types an average of 25 different ratios is available to meet practically every operating condition.

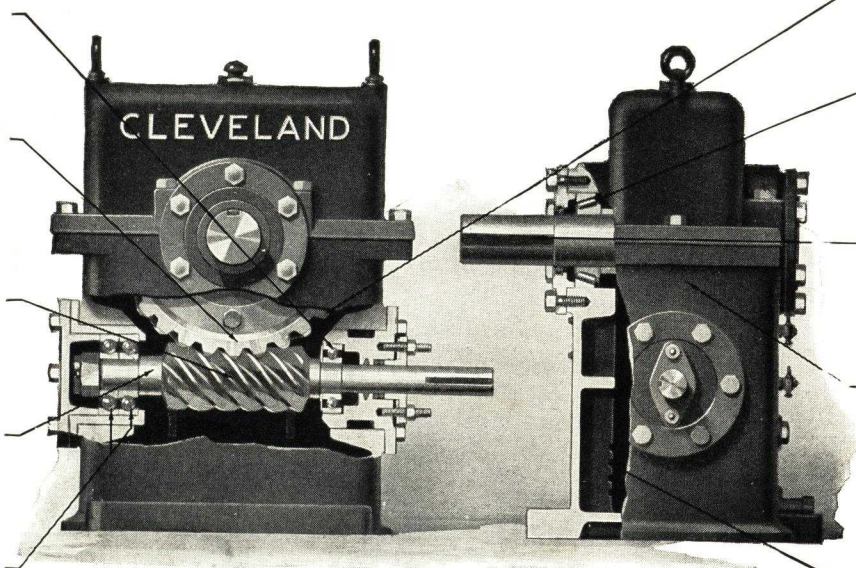
(1) Radial bearing floats free in housing.

(2) Special analysis bronze gear cast from virgin metals and deoxidized with phosphorus. Gear rim shrunk and bolted on cast gray iron center.

(3) Straight body worm with high pressure angle involute thread. Ground all over by process correcting distortion and insuring accurate tooth form.

(4) Worm forged integral with shaft of high-grade alloy steel, heat-treated for maximum surface hardness and core strength.

(5) Combined radial and thrust bearings carrying thrust load in both directions permitting rotation of worm in either direction.



Cutaway View of Type A T Unit for Direct Connected Loads

Power Capacities

Transmission capacities range up to about 200 hp. depending on the ratio and speed required.

Speeds

Speed limitations found in many-gear reduction units do not apply to "Cleveland" drives. Type A T and Type R T can be operated up to 4000 r.p.m., other types to 2000 r.p.m.

Reduction Ratios

Ratios up to 100:1 can be secured with a single worm and gear. For greater reductions it is necessary to use Type D (double reduction) unit. Special worms and gears can be supplied to meet extraordinary requirements.

Shaft Extensions

Shafts on all units can be extended in either or both directions. Shafts longer or shorter than standard will be furnished at nominal charge.

Bed Plate Mounting

When desired, units and driving motors can be mounted at the "Cleveland" plant on cast iron bed plates, thus assuring proper alignment and ease of installation.

Where "Cleveland" Units Are Used

Cleveland Worm Gear Speed Reducers can be applied to practically every kind of industrial machinery requiring efficient transmission of power at reduced speed.

A partial list of applications includes conveyors, cranes, crushers, cutters, dryers, elevators, feeders, lineshaft drives, milling machines, mixers, presses, process machinery, pumps, turbines and fans.

Information Necessary for Recommendation

(1) Horsepower of driving motor or turbine. (2) Actual horsepower to be transmitted. (3) Worm speed. (4) Gear shaft speed. (5) Time unit will be in continuous operation. (6) Description of driven machine or character of service.

Bulletins

For complete information on all sizes of "Cleveland" drives write for Bulletin 112.

(6) Gear teeth accurately generated with hobs made on special machines in our own plant.

(7) Timken heavy duty tapered roller bearings used on each side of gear shaft, carrying both radial and thrust loads. Split bronze journal bearings used on larger sizes.

(8) Accurately ground shaft of extra large diameter with standard extension and keyway. Standard keys furnished for both shafts.

(9) Gray iron housing with heavy wall and flange sections carefully machined. Exterior is rubbed, filled and coated. Interior is smoothed, cleaned and coated with oil and heat resisting compound.

(10) Housing walls reinforced with internal ribs.

THE EARLE GEAR & MACHINE COMPANY

Cut Gears, Operating Machinery, Power Saws, Saw Sharpening Machines
4727 Stenton Avenue, PHILADELPHIA, PA.

NEW YORK, N. Y., 85 Liberty Street

DISTRICT SALES OFFICES
PITTSBURGH, PA., 5724 Bartlett Street

BOSTON, MASS., 110 State Street

Earle Manufacturing Facilities

We have more than 40,000 patterns from which almost any size and type of gear can be made, and our cutter and hob list is just as extensive.

During more than a quarter century in business, much valuable data and experience has been gathered which is at your disposal at all times.

The Earle plant is modern in every respect, and the machine tools are of latest designs and of makes best adapted for the work for which they are intended. Well-paid, high-grade executives, engineers and mechanics only are employed and an endeavor is made to maintain ideal working conditions. Many of our employees have been with us since the founding of the

EARLE GEARS
TRADE-MARK

Company. Prices and delivery promises which you receive will be consistent with amount of labor involved and good workmanship.

Rush and breakdown orders will be given the special attention which they deserve.

Let our engineers work with you on your difficult transmission problems.

If a standard gear will not exactly meet your conditions, it is generally more economical to design a special gear for your requirements than it is to change the machine design to accommodate a standard gear.

Have you sent for *The Earle Gear Book*?

Earle Gears and Pinions

Spur Gears and Pinions—Manufactured in plain, webbed and spoked patterns, from $\frac{1}{2}$ in. to 34 ft. in diameter, and of any practical gear material. Teeth are generated, hobbled, planed or rotary cut by the Earle method of gear cutting, eliminating thick and thin teeth.

Earle Gears are guaranteed as to quality and workmanship.

Non-metallic Gears and Pinions

—For use when silent operation and durability at high speed are essential or elimination of wear on the mating gear is a factor. Gears made of bakelite, formica, etc., are not affected by heat, water, oil, acid or alkali solutions and can be kept in stock indefinitely.

Earle Non-metallic Gears and Pinions can be made of rawhide, formica, fabroil, bakelite, micarta, celeron, etc., and are carefully designed and cut. Spur type capable of operating at peripheral speed up to 2200 ft. per minute.

Spiral Gears and Pinions—Made with generated teeth, sizes from $\frac{1}{2}$ in. to 30 ft. in diameter. All Earle Gears are rigidly inspected to maintain our high standard of quality.

Bevel and Miter Gears and Pinions

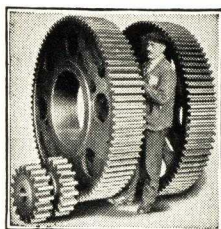
—Made with planed or generated teeth which are theoretically correct. All machined surfaces are accurately finished, which adds greatly to their life and efficiency.

Sizes from $\frac{1}{2}$ in. to 13 ft. in diameter.

Sprockets, Ratchets, etc.

Sprockets for block, roller, silent chains and ratchets of all types are produced on the wide variety of machines in the Earle Plant. We maintain a large stock of cutters in our toolroom which are used on customer's work to save the cost of buying new cutters on each new job.

Racks, Curved or Straight—Earle Racks are made in



both curved and straight types of any desired size, curve and pitch. They are guaranteed to run with their mating pinion or worm and are accurately machined.

Worm Gears and Worm Wheels

—Made in sizes from $\frac{1}{2}$ in. to 30 ft. in diameter, while the worms are made in any size required.

Speed Reducers—Earle Speed Reducers are made in worm, spur, bevel and herringbone types for straight line, right angle or vertical drives. Sizes available from $\frac{1}{2}$ hp. up. Will transmit their rated loads continuously as well as considerably greater loads for a few hours, especially at higher speeds.

Herringbone Gears and Pinions

—Earle Herringbone Gears and Pinions are made with generated teeth, in all diameters from $\frac{1}{2}$ in. to 30 ft. They are made in three general types:

1. Without groove in center.
2. With groove and staggered teeth.
3. With groove and mating teeth.

How to Order Earle Gears

Send complete information as listed below. Repeat orders for Earle Gears can be filled if you will give us order number as stamped on the broken or worn-out gear. A poor sketch is better than none in sending us your orders. If blue-prints are available, it is best to include them with your inquiries and orders. Small gears and pinions can be shipped to us to be duplicated, and in such cases no other information than the quantity required is necessary.

In other cases give us: Kind of gear (spur, bevel, worm, etc.). Quantity. Outside diameter. Pitch diameter. Number of teeth. Pitch (d.p. or c.p.). Number of teeth in mating gear. Face. Bore. Hub dimensions. Keyway. Construction (web, arm, etc.). Material (steel, iron, bronze, etc.).

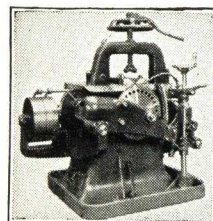
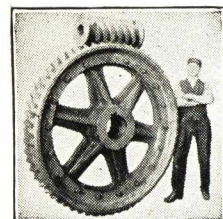
Detailed specifications in our booklet, *Economy in Cold Sawing*, sent upon request.

"Lea Simplex" Cold Metal Saws

Designed for maximum flexibility in operation. It will saw round stock, rails and structural steel into intricate shapes that would be impossible with an ordinary saw. Furthermore, its design enables the operator to clamp any stock accurately and firmly in a minimum of time.

It is made in five sizes for cutting from $5\frac{1}{2}$ to 11-in. round stock, 5 to 10 in. square, 9 to 20-in. I-beams on flat. All machines will make angle cuts up to 45° on smaller stock than maximum capacity without resetting.

Booklet, *Economy in Cold Sawing*, sent on request.



Operating and Special Machinery

Operating machinery for all types of movable bridges, gates, locks, dredges, large valves, marine deck auxiliaries, sewage disposal plants, hoisting and winding devices, sheaves, electric valve operating mechanisms, gate hoists, etc., has been a specialty with us for a number of years, as our long list of successful installations will attest.

We are prepared to make the machinery detail drawings from your general drawings, and to fabricate the machinery. *Earle Power Unit Booklet*, on request.

Centrifugals

We are also prepared to furnish a full line of Cresson-Morris Centrifugals for the Chemical and Sugar Industries.

"Simplex" Hand Grinding and Beveling Machine

This grinder is suitable for sharpening many makes of saw blades. It has a capacity for blades of 12 in. minimum and 40 in. maximum diameter.

THE FALK CORPORATION

MILWAUKEE, WIS.

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NEW YORK, N. Y., 50 Church Street
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WILKES-BARRE, PA., Vulcan Iron Works
YOUNGSTOWN, OHIO, Frank J. Bowers, Inc.

CANADA—William Kennedy & Sons, Owen Sound, Ontario—Branches: Halifax, Montreal, Toronto, Cobelt, Winnipeg, Vancouver
MEXICO—George Spence—Gante No. 8—Mexico, D. F.

HERRINGBONE GEARS

Falk Herringbone Gears, with staggered and continuous teeth, cover the entire range of gear requirements. Any diameter from 1 in. to 16 ft.; any face from 1 in. to 6 ft.; any pitch from

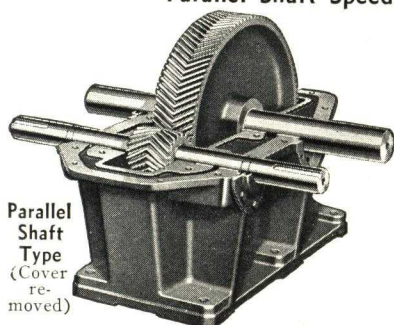
25 to $\frac{3}{4}$ diametral pitch. Speeds up to 16,000 ft. per min. Falk Herringbone and Single Helical Gears have been known for many years throughout industry for long, quiet life and high efficiency.

SPEED REDUCERS

Standardization. All Falk Reducers—17 types—202 sizes, from 1000 hp. down to 0.05 hp.—133 standard ratios from 1.5:1 to 518:1—144 motor bed sizes—are carried in stock for quick

shipment. The Falk staff of engineers will co-operate with you in adapting efficient Falk Drives to your power transmission requirements.

Parallel Shaft Speed Reducers

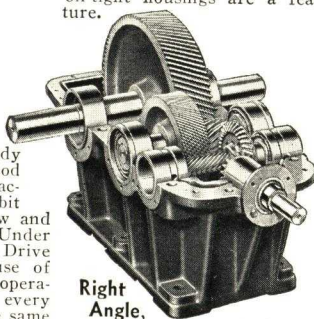


Parallel Shaft Type (Cover removed)

Falk Parallel Shaft Reducers, using precision herringbone gears, are designed so that each unit shall transmit safely its full rated capacity under continuous operation with 100% reserve for momentary overloads in starting or during operation. The result is absolute reliability for continuous duty, and reserve for actual punishment beyond rated capacity. The lubrication system is simple and self-contained—oil-tight housings are a feature.

Right Angle (Horizontal Type) Speed Reducers

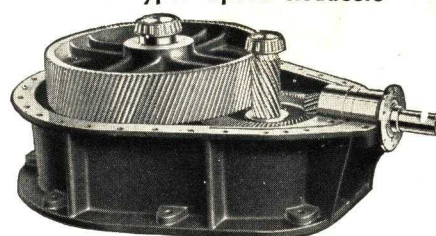
The new Falk Right Angle Drives are distinctly Falk in design and embody all the proved Falk principles of good engineering. This unit is highly practical where space conditions prohibit anything but a gear drive having low and high speed shafts at right angles. Under such conditions the Falk Right Angle Drive is preferred to a worm drive because of Falk ruggedness, efficiency and cool operation. It is of typical Falk quality in every sense of the word and will deliver the same quiet, trouble-free performance for which Falk Parallel Shaft Reducers are noted.



Right Angle, Horizontal Type (Cover removed)

Right Angle (Vertical Type) Speed Reducers

Included in the line of Falk Right Angle Speed Reducers is the vertical type shown at the right. This reducer includes precision single helical and spiral bevel gears and embodies the same high qualities of design and materials for which Falk is so widely known and accepted.



Right Angle, Vertical Type (Cover removed)

Falk Motoreducers

Falk Motoreducers (combined motor and speed reducer) are made in three styles—Integral, Flexible and All-Motor, in sizes from $\frac{3}{4}$ to 75 hp., for speeds of 580 to 1750 r.p.m. and speeds of driven shaft from 2 to 400 r.p.m.

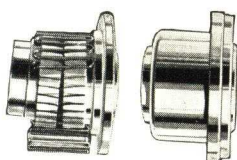
The All-Motor type allows the use of any standard stock motor, without change, and gives compactness, economy, pleasing appearance and a straight line drive.



Helical-gear Motoreducer All-Motor Type

COUPLINGS

Falk Flexible Couplings



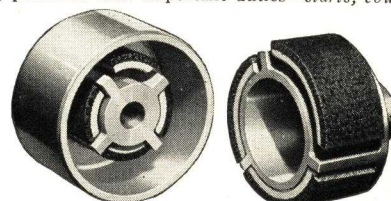
Falk Flexible Coupling (Cover removed)

A design for every purpose and speed. This coupling protects both the motor and the driven machine and insures immunity from shut-down through its unique shock-absorbing qualities. Range, $\frac{1}{2}$ to 18,000 hp. at 100 r.p.m.

Special Advantages—(1) Absorb shock and vibration. (2) Allow both lateral and torsional elasticity. (3) Float freely under load. (4) Easily connected and disconnected. (5) All steel. (6) Perfectly lubricated. (7) Cannot rust. (8) Operate equally well in both directions. (9) Accommodate both parallel and angular misalignment.

Falk-Rawson 4-Duty Couplings

The Falk-Rawson Coupling performs four important duties—starts, couples, cushions and limits the load. It makes possible an important saving in electrical equipment—protects the machine or product being made by affording smooth, gradual starting and cushioning of overloads. It frequently cuts the electrical bill by reducing inrush current and allowing selection of smaller motors operating closer to maximum capacity. Write for bulletin.



Falk-Rawson 4-Duty Coupling

FOOTE BROS. GEAR & MACHINE CO.

Manufacturers of Industrial Gears, IXL Spur and Worm Gear Speed Reducers
Dept. 7, 215 North Curtis Street, CHICAGO, ILL.

Products

HEAVY DUTY GEARS and PINIONS: Spur, Worm, Miter, Bevel, Spiral, Helical and Herringbone Gears; SPUR, HELICAL, HERRINGBONE and WORM GEAR SPEED REDUCERS; IXL Helical and Worm Powered Gears Speed Reducers; FLEXIBLE COUPLINGS; FRICTION CLUTCHES.

Also Tractors and Road Graders for construction, maintenance and patrol of roads; Silent Timing Gears of Micarta, Cast Gears, Power Transmission Equipment, Sprockets, Flywheels, Pulleys, Clutch Pulleys, Shafting, Bearings, Hangers, Pillow Blocks, Belt Tighteners, Hand Wheels, Rigid Couplings, Jaw Clutches and Special Machinery built to order.

Our Engineering Department at Your Service

Our engineers are experienced in solving transmission, gear and special machine problems in practically every industry. We design or build to your specifications special machinery of all kinds.



Established 1859
TRADE-MARK

Literature

Send for 660 page data book *Gear Problems*, on power transmission equipment, and bulletins on spur, worm and herringbone speed reducers and flexible couplings.

IXL High Efficiency Gears

We manufacture gears of all kinds and sizes for every purpose and of every usable material. Spur, worm, bevel, miter, spiral, helical, internal, herringbone and machine racks.

Also "IXL-ITE" Toolhard Gears with ground teeth accurate to 2/10,000 of an inch. All IXL Gears are made of highest quality metal cut on modern generating machines—scientifically heat treated—rigidly tested and closely inspected before shipment.

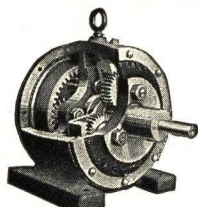
IXL Friction Clutches and Transmission Equipment

We manufacture the Plamondon Disc type, Positive Pull-out Clutch, also a full line of flexible couplings, sprockets and general power transmission equipment.

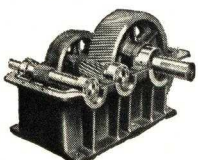
IXL SPEED REDUCERS

IXL Spur Gear Speed Reducers

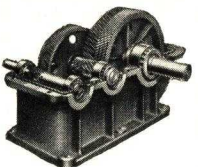
Compact, highly efficient, self-lubricating, enclosed transmissions for reducing speeds of electric motors and other prime movers and delivering power to operating equipment. Replaces belting, pulleys, chain and rope drives, open gearing, etc. They eliminate danger from exposed moving parts, are unaffected by dirt, dust and grit or moisture; save much valuable space and give continuous uninterrupted service with practically no maintenance cost. Used in every industry for driving conveyors, elevators, hoists, rotary kilns, crushers, pumps, compressors, grinders, agitators, mixers, automatic stokers, coal feeders, ash handling equipment, line shaft drives, etc. Made in straight-line drive, right angle and vertical types. Sizes up to 150 hp. Ratios up to 350 to 1.



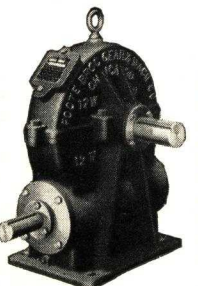
IXL Reducer



IXL "Titan" Helical Gear Reducer—Double Reduction



IXL "Titan" Herringbone Gear Reducer—Double Reduction



IXL Worm Gear Speed Reducer

IXL "Titan" Helical and Herringbone Gear Speed Reducers

The "Titan" Speed Reducers are identical in design with exception that in one case the gears are heat treated helical type and in the other continuous tooth herringbone, with 30 degree helix angle.

The "Titan" Helical Speed Reducer is capable of transmitting greater horsepower capacity than the "Titan" Herringbone Gear Speed Reducer, size for size.

Especially adapted for heavy duty drives requiring highest efficiency, high speeds, high reduction ratios and extreme silence in operation.

Both types of reducers are made in single and double reduction types. Sizes up to 300 hp. Ratios range from 2.87 to 1, to 96.2 to 1. Efficiency of the single reduction units runs as high as 98% to 99% under full load, and 96% to 98% efficiency under full load for the double reduction units.

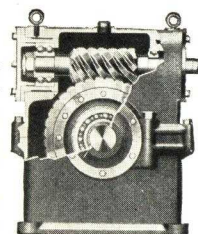
IXL Standard Worm Gear Reducers, Type W

Sturdy in construction, compact, fully enclosed and self-lubricating with bronze babbitted, radial bearings, and ball thrust bearings on worms. Will satisfactorily handle all ordinary requirements, where high efficiency is not essential. Also made with worm at top and vertical style for all standard sizes and ratios. Sizes up to 100 hp. Ratios from 7 to 1 up to 120 to 1. Vertical machines are chiefly used with stirring, agitating and mixing machinery. For high efficiency and heavy duty requirements, we recommend our Type HG "Hygrade" Worm Reducer.

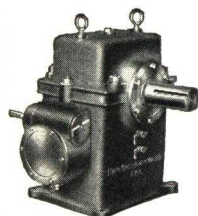
IXL "Hygrade" Anti-friction Bearing High Efficiency Worm Reducers

Designed for right angle drives, requiring high efficiency, long life and *more than the usual wearing qualities* under continuous service and severe operating conditions. Made with worm at bottom or top and in vertical type, all parts interchangeable except cases. Sizes up to 140 hp. High grade radial and thrust ball bearings used on worm shafts, and Timken roller bearings on gear shaft.

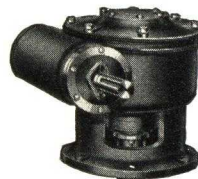
The "Hygrade" Vertical type is the same general construction as standard type having the same ratios and ratings. Slow speed shaft extends either upward or downward as desired. Type HGD Double Reduction can be furnished in ratios ranging from 50 to 1 up to 2500 to 1.



HGT Worm Reducer, Worm at Top



HGD Double Reduction Unit



Type HGV Vertical Worm Reducer



Type MDX or MTX Double or Triple Reduction Helical Type Powered Gear



"Radiating" Worm Type Powered Gear

IXL Powered Gear

Helical Gear Type Motorized Speed Reducer—Can be furnished in three types M.S.X. Single Reduction, M.D.X. Double Reduction and M.T.X. Triple Reduction ranging from 3.95 to 1110 r.p.m. on the slow speed shaft with capacities from ¼ to 75 hp.

They are available with any standard type of N.E.M.A. frame motor including those with normal starting torque, high starting torque, slip ring, adjustable speed, multi-speed, etc.

Single reduction units are furnished with offset parallel drive having the gears and housing securely mounted on the motor housing. Double and triple reduction units are furnished with straight through concentric drive with the motor mounted on the reducer housing.

"Radiating" Worm Type Motorized Speed Reducer—Furnished in two types HGM Single Reduction and HGD Double Reduction units ranging from 13.0 to 538 r.p.m. on the slow speed shaft in capacities from ½ to 20 hp. sizes. The motor is supported from the reducer with greater rigidity and strength provided by the base extension on the motor side of the reduction unit.

All Worm Powered Gears feature the exclusive "Radiating" design which provides heat radiating corrugations on the worm housing, resulting in cooler operation and increased thermal hp. ratings.

Double Reduction units furnished in ratios from 90 to 1 to 3600 to 1, and in capacities from fractional hp. to 20 hp. sizes.

D. O. JAMES MANUFACTURING COMPANY

Speed Reducing Transmissions; Cut Gears; Racks and Flexible Couplings
1114 West Monroe Street, CHICAGO, ILL.

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Products

GEAR SPEED REDUCERS of every type, including:

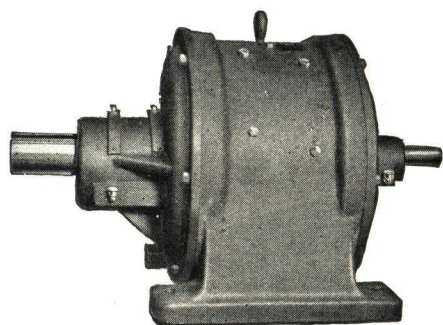
Planetary Spur Gear, Medium and Heavy Duty Worm Gear, Generated Continuous Tooth Herringbone and Spiral Bevel Gear Speed Reducers and Motorized Speed Reducers in styles to drive up, down, horizontally or at an angle.

D.O.JAMES

GEARS of all materials in all sizes, including:

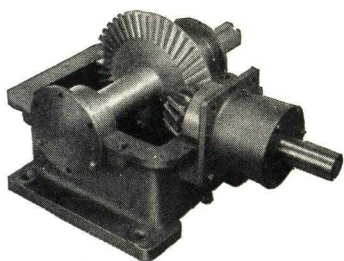
Cut, Spur, Straight and Spiral Tooth Bevel, Mitre, Spiral, Worm, Internal, Helical, Herringbone and Tractor.

Also Sprocket Wheels, Racks, Flexible and Universal Couplings and combined Automatic Back-stop and Flexible Coupling.



Planetary Spur Gear Speed Reducers
Straight Line Type — James Planetary Spur Gear Straight Line Speed Reducers are available in all sizes, $\frac{1}{4}$ to 50 hp., ratios from 4:1 to 1600:1, and

larger. Many standardized sizes are carried in stock for immediate shipment.



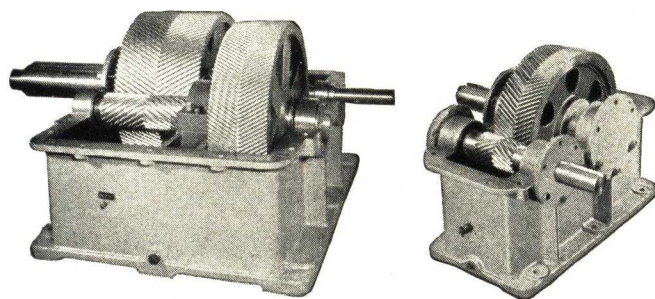
Spiral Bevel Gear Speed Reducer

Spiral Bevel Gear Speed Reducers

Horizontal and Vertical Spiral Bevel Gear Speed Reducers, available in sizes from $\frac{1}{2}$ to 300 hp. Ratios 1:1 to 6:1.

Herringbone Gear Speed Reducers

James Generated Continuous Tooth Herringbone Gear Speed Reducers are made in single and double reduction types for heavy duty and severe service. Sizes 1 to 1000 hp. or larger. Ratios $1\frac{1}{2}$:1 to 100:1.



Herringbone Gear Speed Reducers

Heavy Duty Worm Gear Speed Reducers

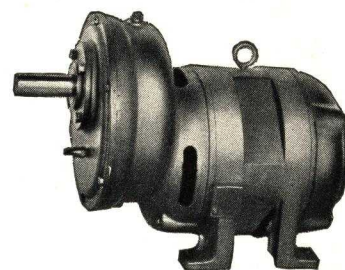
James Heavy Duty Worm Gear Speed Reducers are made with Worm top or bottom, to drive up or down, or at right angles. Latest and most advanced types, sizes 1 to 100 hp. Ratios from 6:1 to 60:1.



Heavy Duty Worm Gear Speed Reducer

Motorized Speed Reducers

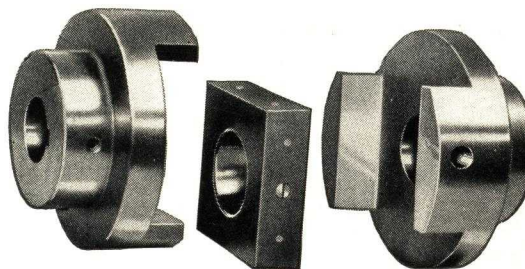
Herringbone type available in a large range of sizes.



Motorized Speed Reducer

Flexible Couplings

D. O. James Flexible Coupling, mechanically flexible, simple construction—only three parts.



Flexible Couplings

Complete Catalogue

Send for literature giving complete engineering data.

W. A. JONES FOUNDRY AND MACHINE COMPANY

Manufacturers of Speed Reducers and All Types of Transmission Equipment

4403 Roosevelt Road
CHICAGO, ILL.

SALES AND ENGINEERING OFFICES IN PRINCIPAL CITIES

Products

SPEED REDUCERS, Spur, Worm, Herringbone and Herringbone-Maag; CUT GEARS; CAST SEMISTEEL PULLEYS; V-BELT SHEAVES; FLEXIBLE COUPLINGS; CAST TOOTH GEARS.

Also Friction Clutches and General Transmission Equipment.

General Advantages of Jones Speed Reducers

Jones Speed Reducer Units are designed to reduce the drive revolution per minute of high speed prime movers—such as electric motors, turbines, etc.—with absolute minimum of power loss. By manufacturing all three general types of speed reducers, worm, herringbone and spur, Jones is prepared to furnish the most approved speed reducer type for every individual installation and thereby eliminate needless belts, chains, open gearing, etc. All Jones Reducers are fully enclosed, dustproof, self-contained units. They are unusually quiet, efficient, and operate for years without maintenance cost or attention of any kind, save lubrication.

Jones Spur Gear Reducers

Power is transmitted by a balanced straight line drive, fully enclosed, oil proof and dust proof. Pinions and gears are of high carbon steel forged integral with shafts. Tooth form used is 20 degree involute stub assuring greater strength, more even wear on contact, less slippage, higher efficiency and longer life than standard 14½-degree involute. Bearings are of phosphor bronze of liberal size. All moving parts operate under the most favorable conditions in a bath of lightbodied oil. The high speed shaft and the low speed shaft have the same direction of rotation. Motor and reducer are usually mounted on a cast iron bed plate and properly aligned in our shop.

Available in ratios from 5½ to 1 up to 200 to 1. Horse powers from ½ to 75. All parts carried in stock ready for assembly on order.

Jones Worm Gear Reducers

A right angle drive. Fully enclosed, oil proof and dust proof. Roller bearing equipped. Housings are well ribbed and of rugged construction. Worm is of low carbon alloy steel forging, hardened and ground. Worm wheel is made of nickel bronze alloy by the most modern process of chill casting. A large reservoir in the lower portion of the housing provides ample oil capacity.

Available in ratios from about 4 to 1 up to 90 to 1. Horse powers from ¼ to 100. All parts carried in stock ready for assembly on order.

Jones Herringbone and Herringbone-Maag Gear Reducers

A parallel shaft drive. Fully enclosed, oil proof and dust proof. Roller bearing equipped. All pinions are of heat treated chrome nickel steel integral with their shafts. Gears

Jones

are high-carbon forged or cast steel. The herringbone pinions and gears are Parkinson generated. The Maag gears are true involutes—the finest tooth form known to gearing. Shafts can be double projected. Lubrication of all working parts is automatic with a medium-bodied oil in a dust proof housing. These machines are designed and constructed in accordance with the latest and most improved engineering practice.

Available in ratios from 1.25 to 1 up to 72 to 1. Horse powers from 1 to 400. All parts carried in stock ready for assembly on order.

Jones Series "OH" Worm Gear Reducers

A medium duty worm gear reducer used in conjunction with electric motors of relatively small horse power. Where light weight, small space occupied, and minimum cost per unit of power transmitted are necessary, they can be employed to advantage.

Available in ratios of 5 to 1 up to 50 to 1. Horse powers up to 7. All units carried in stock, boxed individually, ready for immediate shipment.

Jones Series "DW" Herringbone-Maag Gear Reducers

Same as the standard Jones Herringbone-Maag Gear Reducers except these units are supplied with high and low speed shaft extensions on both sides. This obviates the necessity of a right or left hand assembly. Low speed shafts are designed to carry overhung loads.

Available in ratios of 12 to 1 up to 48 to 1. Horse powers up to 18. All units carried in stock, boxed individually, ready for immediate shipment.

Jones Flexible Couplings

For use with Jones Speed Reducers or wherever flexible couplings are required. Three styles to meet all required.

Style AA—Fabric disc type, primarily used for connecting motor shafts to reducers and where high speeds are encountered. Style D—Steel floating center piece type, suitable for transmitting heavy loads and generally used for connecting reducer low speed shafts to driven machines.

Jones Cut and Cast Tooth Gears

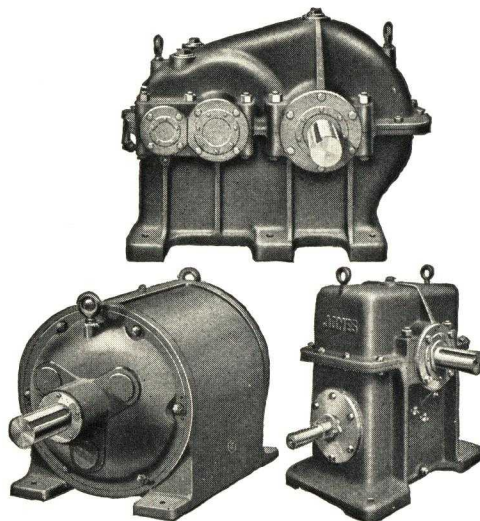
Jones cut gears are generated on the finest gear generating equipment available. They are precision products. All practical types of gears in a wide range of styles and sizes are manufactured.

Jones cut gears are standardized as to face widths, diameters, ratios and pitches.

Also, a complete line of standard stock patterns for the production of cast tooth gears of all types.

Jones V Belt Sheaves

A precision product made of semi-steel for ½x½, ¾x¾, 1¼x¾ and 1½x1-inch V belts in pitch diameters from 2 to 96 inches, with multiple grooves, straight bored, taper bored, keyseated and set screwed as specified. Grooves are made to accurate gauges and are carefully inspected.



Jones Speed Reducers—Spur, Worm, Herringbone and Herringbone-Maag Types

PHILADELPHIA GEAR WORKS

Manufacturers of Gears and Speed Reducing Units

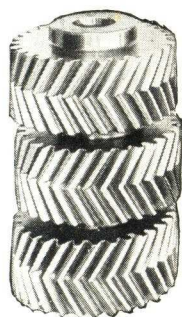
BELL TELEPHONE
Regent 6602

Erie Avenue and "G" Street
PHILADELPHIA, PA.

BRANCH SALES AND ENGINEERING OFFICES

NEW YORK, N. Y., 330 W. 42nd Street

PITTSBURGH, PA., Farmers Bank Building



Continuous Tooth
Herringbone Gears

50% longer life than cast steel gears, plus freedom from hidden blow-holes and casting strains.

Continuous Tooth Herringbone Gears

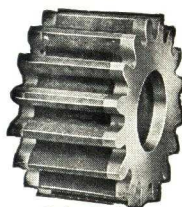
Especially adapted for heavy-duty drives when continuous service is required and where high efficiency of operation is an important factor. Used extensively for hoisting machinery. Also suitable to use for speed-increasing gear trains, at lower ratios. Our equipment will produce herringbone gears either with or without the gap at the center, in sizes up to 160 in. in diameter, 36-in. face, in any pitch or material.

Ground Thread Worms

Philadelphia Worms are of our own form of design, ground on our own special grinders. They are made of the highest grade heat treated alloy steel. These worms have a full bearing and proper tooth contact with the worm wheel.

Spiral Bevel Gears

These gears are made in various sizes and materials. They insure smooth operation, freedom from vibration, great tooth contact and are suitable for use where a right angle drive is required.



Fabroil Gear

Non-metallic Gears

We recommend Fabroil, Textolite or Rawhide pinions for use where silence or shock absorption must be considered. They are unaffected by oil, water, acid, or alkali solutions. On ordinary sizes and types we can give 24-hour service.

Philadelphia Speed Reduction Units

We have perfected a complete line of speed reduction units available in spur, worm, herringbone, spur and bevel, and spiral-bevel herringbone gear types. They are compact, power saving, quiet, safe, dirt-proof and moistureproof, long-lived, and very low in maintenance cost. They are built of the highest grade materials and offer straight line, right angle or vertical drive. For heavy loads at high speeds, we recommend the Philadelphia Continuous Tooth Herringbone Gear Units (Sykes Tooth Form).

Cut Gears

Gears from $\frac{1}{2}$ to 14 ft. in diameter; spur, bevel, herringbone, helical, miter, internal, and worm types—of steel, brass, bronze, iron, aluminum, etc.—also Fabroil, Textolite, and Rawhide pinions.

Welded Gears

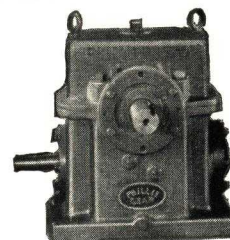
"Philweld" Gears are built-up by modern welding (not cast) methods, from highest grade, dense, homogeneous Rolled Steel Plate. They have 50% higher tensile strength, 30% to



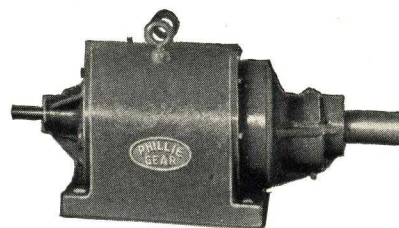
A Philadelphia
MotoReduceR
(Horizontal type)

Philadelphia MotoReduceR

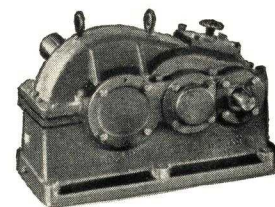
These "features" of the Philadelphia MotoReduceR challenge comparison: Extremely compact, offering considerable saving in space. Permanently accurate alignment. High operating efficiency. Minimum of maintenance cost. No overhung motors or gear cases. Perfectly balanced. Greater stability. Freedom from vibration. Practically noiseless. All parts easily accessible. Requires no flexible couplings or base plates. Gears are of heat treated nickel steel with helical cut teeth, and anti-friction bearings are used throughout. The slow-speed shaft is mounted on over-size Timken bearings to accommodate a sprocket pinion or pulley. Positive lubrication is assured by complete oil bath. The MotoReduceR is available in single, double and triple types with ratios up to 450:1—and can be furnished with standard open type or totally enclosed fan cooled motors, polyphase and single phase. Also available with direct current motors up to 10 hp.



Worm Gear Unit



Spur Gear Unit



Double Reduction
Herringbone Gear Unit

Catalogues

Catalogues describing and illustrating the line of Philadelphia Speed Reducers and MotoReduceR sent upon request.

WESTINGHOUSE ELECTRIC & MFG. COMPANY

NUTTALL WORKS
PITTSBURGH, PA.

For Sales Offices, Service Repair Shops and Agent-Jobbers, see Our Catalogue on Switchboards, Motors, Etc., as Listed in Manufacturers' Index

CANADA: Lyman Tube and Supply Co., Ltd., MONTREAL AND TORONTO

Products

GEARS, including:

Spurs, $\frac{3}{4}$ -in. to 30-ft. diameter and pitch up to 8 in.
Bevels: generated teeth, 1 to 25-in. diameter and pitch up to $1\frac{3}{4}$ diametral pitch; planed teeth, 1-in. to 20-ft. diameter and pitch up to 6 in.
Worm Gears, 2 to 162-in. diameter up to 1 diametral pitch.
Worms, 12-in. outside diameter, $2\frac{3}{8}$ -in. thread depth.
Helicals, 2 to 162-in. diameter up to 1 diametral pitch.

Spirals, 1 to 162-in. diameter up to 1 diametral pitch.
Herringbone, up to 30-ft. diameter up to 8-in. pitch.

Miters, same as for bevel gears.

REDUCTION GEAR UNITS, for heavy duty mill drive service.

SPEED REDUCERS, for any service.

FLEXIBLE COUPLINGS.

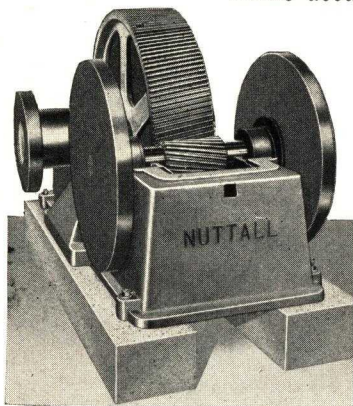
For other Westinghouse Products, see Manufacturers' Index.

Heat Treated Gearing

Facilities are available for heat treating gears of any size, type or design. Standard grades of heat treated gears are Oil Treated, Case Hardened and BP. The BP "tough-hard" is guaranteed to have *four times* the life of untreated medium carbon steel gears in similar service. The BP "tough-hard" treatment is not limited to gearing but can be applied to any rapidly wearing part.

Gear Tooth Grinding

Complete equipment is provided for grinding gear teeth in spur gears up to 6 ft. in diameter, giving extreme accuracy and a fine finish.



Mill Drive Gear Unit

Mill Drive Gear Units

These units are designed to transmit heavy loads at relatively high speeds. They are for such services as main and auxiliary mill drives, driving hoists, crushers, pumps, fans, etc.

They are equipped with either single helical gears or herringbone gears and roller bearings.

Speed Reducers

Standard speed reducers cover a range up to 650 hp. and have reduction ratios of from 2.82:1 to 70.5:1. Reducers are equipped with helical gears and roller

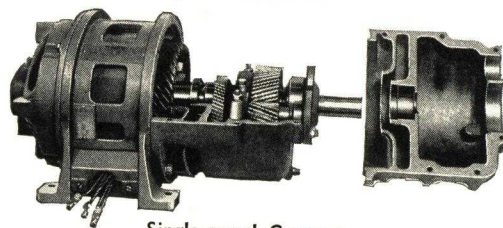


Standard Single Reduction Speed Reducer

bearings. Gears, pinions and shafts are .40-.50 carbon steel. Shafts are ground to close limits.

Gearmotors

Self-contained drive units that serve the double purpose of motor and speed reducer.



Single-speed Gearmotor

Single Speed—

Units have output speeds of 15 to 1550 r.p.m. and are made in capacities of $\frac{1}{2}$ to 75 hp.

Multi-speed —

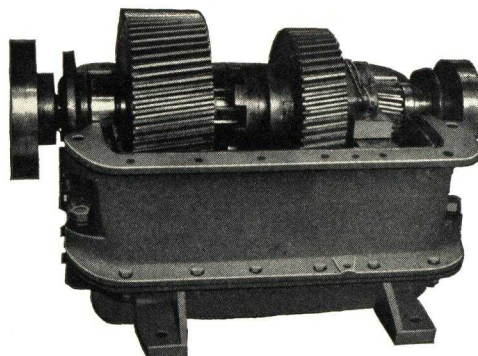
Units have four instantly adjustable speed reductions and are made in capacities of $\frac{1}{2}$ to 15 hp.



Multi-speed Gearmotor

Special Gear Units

The salient features of Westinghouse-Nuttall standard line of speed reducers can be incorporated in gear reduction units for any special requirements. Many such units are now in operation.



Specially Built Two Speed Reduction Gear Unit

Flexible Couplings

Couplings which compensate for slight misalignments and absorb shocks and torsional vibrations are available in sizes and capacities for all classes of service.

NEW ENGLAND TANK & TOWER COMPANY

Agitators, Drives and Tanks for the Chemical Industries

EVERETT, MASSACHUSETTS

(BOSTON POSTAL DISTRICT)

BRANCH OFFICE: 50 Church Street, NEW YORK, N. Y.

Products

AGITATOR DRIVES; TURBINE MIXERS.

Also Wood and Metal Stirrers, Wood and Metal Turbines, Wood Tanks and Vats, and a full line of Agitator, Stirrer and Tank Accessories.

New England Agitator Drives

Designed specifically for agitation work and built in a modern plant devoted exclusively to the construction of agitator equipment of all types.

This specialization, many years' experience in the field of agitation work and close contact with production requirements, have enabled the NEW ENGLAND TANK & TOWER COMPANY to develop the most modern types of agitator drives and make them available in the most usable range of units.

New England Type "T" Agitator Drives are now available in a complete range of sizes and ratios: from $\frac{1}{4}$ to 60 hp., with speed range from 0.4 r.p.m. to 500 r.p.m.

These modern agitator drive units have been designed to provide the simplest, most compact and quiet means of transmitting power from prime movers to agitators, stirrers and mixers.

Outstanding Characteristics—Fully enclosed. Continuous self-lubrication of gearing. Quiet running. Anti-friction bearings throughout. Oil trapped against leakage. Trouble-free. High efficiency and utmost economy of operation.

The extreme range of ratios available makes it possible to use, in all cases, standard high speed motors connected directly to the agitator units, without the necessity of any intermediate reduction unit, or the use of special low speed or geared motors.

New England No. 1—A strictly portable mixer of $\frac{1}{4}$ hp. capacity.

A very light, exceptionally high grade unit. It can be operated from any lamp socket, and is readily attached to any type of container.

Equipped with New England turbine. The most efficient of all impeller and propeller types of stirrers.

A thoroughly satisfactory outfit in all respects.

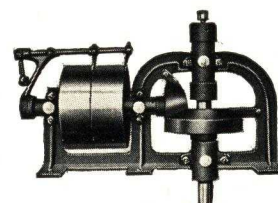
New England No. 3—One of the most popular direct-connected agitator drives manufactured, for loads of 2 hp. or less. Lubrication by complete oil bath. Suitable for either low or high speed agitation. Readily made portable for serving a battery of tanks.



TRADE-MARK

"Nett-Co" Agitator Drives (Open Geared Models)

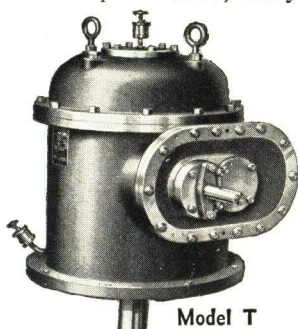
"Nett-Co" Standard Agitator Drives—Moulded cast iron gears or machine-cut gears, as desired. A standard unit of this type, manufactured in sizes listed below, and carried in stock for immediate shipment.



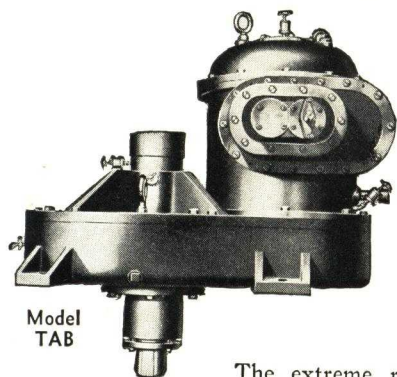
No. 300 "Nett-Co" Open Drive

No.	Base		Max. Hght., in.	Tight and loose pulleys, in.	Gear		Teeth	Pinion		Gear Shaft	
	Lgth., in.	Width, in.			Diam., in.	Face, in.		Diam., in.	Teeth	Size, in.	Project, ft.
00	22 $\frac{5}{16}$	6	12 $\frac{3}{16}$	8x3	8.8	1 $\frac{1}{4}$	44	2.4	12	1 $\frac{3}{16}$	3
100	32 $\frac{5}{16}$	9	20 $\frac{3}{16}$	12x4	13.37	2	56	3.34	14	1 $\frac{15}{16}$	4
150	37 $\frac{7}{8}$	11	22 $\frac{3}{16}$	12x4	17.19	2 $\frac{1}{2}$	54	4.46	14	1 $\frac{15}{16}$	4
200	47 $\frac{5}{8}$	12	24 $\frac{3}{16}$	18x5	23.87	3	60	5.97	15	2 $\frac{7}{16}$	4
*300	33 $\frac{3}{8}$	11	22 $\frac{3}{16}$	12x4	10	2	30	5	15	2 $\frac{3}{16}$	4
*300	33 $\frac{3}{8}$	11	22 $\frac{3}{16}$	12x4	12	2	60	4	20	2 $\frac{3}{16}$	4
*300	33 $\frac{3}{8}$	11	22 $\frac{3}{16}$	12x4	8	2	32	8	32	2 $\frac{3}{16}$	4
*350	33 $\frac{3}{8}$	11	22 $\frac{3}{16}$	12x4	12	2	60	4	20	2 $\frac{7}{16}$	1 $\frac{7}{16}$

*Machine-cut gears only.



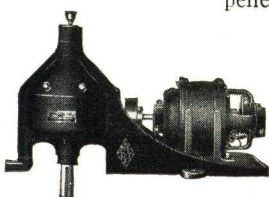
Model T



Model TAB



New England Portable Mixer No. 1



No. 3 Drive

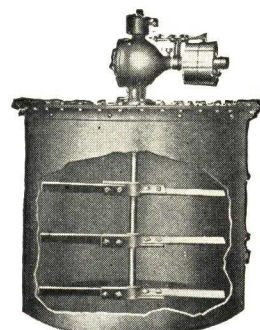


"Nett-Co" Turbine Mixer

An unusually efficient agitator, especially suited for any process that requires very rapid stirring and complete agitation.

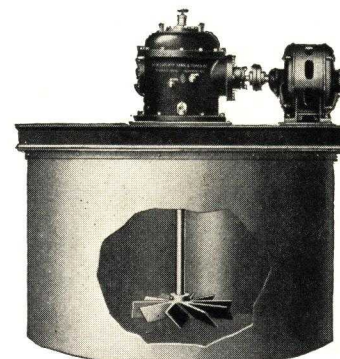
The "Nett-Co" Turbine Stirrer is simple in design—no crevices or passages to catch and hold materials—no accessory vanes or rings are needed.

Furnished in wood, iron, bronze, monel, lead and acid-resisting alloys. It can be adapted for almost any capacity.



Paddle Type "Nett-Co" Stirrer

Made of various metals—wood, cast iron, etc. Many standard forms and special shapes



Turbine Type "Nett-Co" Stirrer

Used for obtaining quick, vigorous mixing. Run at relatively high speeds. Made of wood or any metal

FABREEKA BELTING

For Power Transmission and Conveying

FABREEKA BELTING COMPANY
INCORPORATED

20 East Street, BOSTON, MASS.

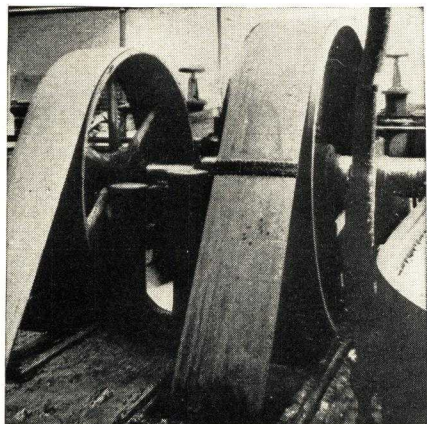
BRANCH OFFICES

NEW YORK, N. Y., Chrysler Building

CHICAGO, ILL., 529 South Franklin Street

DISTRIBUTORS LOCATED THROUGHOUT THE UNITED STATES

FABREEKA



Fabreeka Belting Driving a Beater in a Paper Mill

For *spinning* and *twisting* where uniform application of power means uniform quality of product, FABREEKA has no superior.

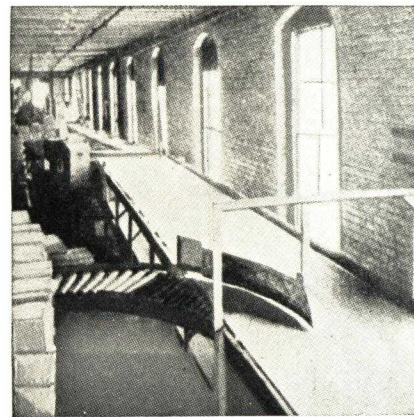
Used with great success in *paper mills* on screens, beaters and Jordans.

Especially suitable for conveying *tobacco* directly on the belt. No odor or material will get into the tobacco. Belts can be cleaned with hot water or steam.

Perfect for conveying *machine parts*, *boxes*, etc., which must proceed in straight lines. Perfect tracking and absence of flap is characteristic of FABREEKA.

Very practical in *laundries* for extractors, washing machines and flat-work ironers.

Used in nationally known *creameries* on separators, churns, bottle washers, cooling machines, etc. FABREEKA is not affected by moisture.



This Fabreeka Conveyor Belt Was Installed in 1924 and Is Still Running

Five Features of Fabreeka Belting

(1) Construction

The base material of FABREEKA is a fine high-grade cotton fibre tightly twisted and closely woven. Each layer is treated with a special compound and the required number of layers, to a predetermined thickness, are fused together under high pressure into a dense, uniform belt, 48 inches wide and about 600 feet in length, which can then be cut into any width or length desired.

Each layer is full length and *without joints*. The number of layers or plies used determines the thickness or weight of the finished belt. The standard weights are 3, 5, 7, 9, 11, 14 and 17-ply.

(2) Pliability

In passing around a pulley, a belt conforms to the shape of the pulley so that the inside belt surface has the same curve as the pulley, and the length of the curve is equal to the arc of contact.

The outer portions of the belt, however, as they curve around the pulley, must necessarily, on account of the thickness of the belt, be somewhat longer than the inside. This condition creates a strain which tends to force the plies apart.

FABREEKA plies, however, are so thin and so close together that when going over the pulley there is scarcely any difference in the radius of the arc of one ply and the next to it. There is, therefore, practically no tendency to creep between adjacent plies, and what little there is, is absorbed by the elastic compound.

Thus the thin construction of FABREEKA Belts permits them to hug small pulleys *without ply separation or bootlegging*.

(3) Surface, Efficiency and Uniformity

FABREEKA is a smooth-surfaced belt and, therefore, presents a large area for actual contact with the pulley. There is no vibration or slipping with FABREEKA Belts which means no retarding of momentum and no vibration of light-weight spindles or shafts. FABREEKA Belts run truly, steadily and smoothly.

The two ends of a FABREEKA Belt are the same thickness. When fastened with proper fasteners or made endless, the inner surface of the belt has no jumpy places—no thick or thin spots.

Every foot of FABREEKA is controlled all through the manufacturing processes and is strictly uniform. The density, pliability, weight per ply and thickness are *always* the same, as the compound is uniformly applied and the fabric is woven with the same number of picks per inch. There are no joints or cemented seams in FABREEKA Belts. Uniformity in thickness is an important consideration. The edges flex to the shape of the pulley exactly as does the center of the belt.

(4) Edges and Salvage Value

The cross section of FABREEKA is rectangular, the edges are as thick as the center. *There are no selvages or folds*, nothing to open up when rubbing against guides or shifters. The edges are square and consequently take wear evenly and without causing the belts to unravel.

When a FABREEKA Belt is damaged or needed for shorter or lighter drives, it can be cut down in length or width, or stripped of plies to reduce thickness. Many rubber or fabric belts have no salvage value after being damaged. Even after FABREEKA has been cut to a narrowed measure or after running on crowned pulleys, it will continue to run evenly because it does not stretch.

(5) Waterproof*No Stretching or Shrinking*

The close-woven fabric and the assembly of the layers *under pressure* reduce stretch to a negligible quantity. FABREEKA Belts need lacing or fastening just once, not many times. There are no periods of half efficiency. They can be fitted to pull in accordance with requirements. FABREEKA grips and wraps better. There is no slipping of belt surfaces, no dropping on to shipper rods with accompanying wear. A running FABREEKA Belt can hardly be distinguished from an idle one so steady and smooth is its operation, proving that the maximum power

is transmitted to the machine and not wasted in belt gymnastics.

The wet morning stretch is eliminated entirely. Exposure to weather does not oxidize or age FABREEKA. Steam does not penetrate into the pores and, therefore, has no deleterious effect. In fact, FABREEKA can readily be washed with live steam or with soap and water without injury to the belt. It is practically impervious to the action of chemicals. FABREEKA Belts never break of their own self-tightening. Their non-shrinking quality is due to the close-woven, pre-shrunk fabric, the special compound and the pressure-fused plies.

Fabreeka Belt Data

FABREEKA			
Style	Weight, lbs. per sq. ft.	Thickness, in.	Minimum pulley diameter, in.
3-ply, special single.....	0.34	4/64	1
5-ply, special single.....	0.56	6/64	2
7-ply, special single.....	0.73	8/64	3
9-ply, regular single.....	0.89	10/64	5
11-ply, heavy single.....	1.07	12/64	6
14-ply, light double.....	1.32	15/64	8
17-ply, heavy double.....	1.57	18/64	12

COMPARISONS

Fabreeka	Leather	Rubber, canvas or Balata	Clipper or Detroit	Alligator lace	Talcott
3-ply			No. 1	No. 00	
5-ply			No. 1	No. 1	
7-ply		3-ply	No. 1	No. 1	161 (Acme)
9-ply	Medium single	4-ply	No. 2	No. 15	145-151
11-ply	Heavy single	4 or 5-ply	No. 2	No. 20	45-51
14-ply	Light double	5 or 6-ply	No. 3 or 4	No. 25	60-63
17-ply	Medium double	6 to 8-ply	No. 5	No. 35N	72-75

FASTENERS

CRESCENT PLATES		CRESCENT RIVETS	
Pulley diameter	Type	Fabreeka	*Rivet, in.
Under 6-in.	Short grip	9-ply	6/16
Under 12-in.	Medium grip	11-ply	7/16
12-in. and up	Long grip		

*Use only large shank rivets.

FABREEKA BELTING (PRICE PER LINEAL FOOT)

Width, in.	*Single	**Double	Width, in.	*Single	**Double	Width, in.	*Single	**Double	Width, in.	*Single	**Double	Width, in.	*Single	**Double	Width, in.	*Single	**Double
1 1/2	\$0.12	\$0.24	2	\$0.48	\$0.96	4	\$0.96	\$1.92	8	\$1.92	\$3.84	18	\$4.32	\$8.64	30	\$7.20	\$14.40
3/4	.18	.36	2 1/4	.54	1.08	4 1/2	1.08	2.16	9	2.16	4.32	20	4.80	9.60	32	7.68	15.36
1	.24	.48	2 1/2	.60	1.20	5	1.20	2.40	10	2.40	4.80	22	5.28	10.56	34	8.16	16.32
1 1/4	.30	.60	2 3/4	.66	1.32	5 1/2	1.32	2.64	12	2.88	5.76	24	5.76	11.52	36	8.64	17.28
1 1/2	.36	.72	3	.72	1.44	6	1.44	2.88	14	3.36	6.72	26	6.24	12.48	38	9.12	18.24
1 3/4	.42	.84	3 1/2	.84	1.68	7	1.68	3.36	16	3.84	7.68	28	6.72	13.44	40	9.60	19.20

*Special, Regular and Heavy.

Note: The above are standard widths and are carried in stock in Boston and Chicago. Special widths not listed will be billed at price of next wider size.

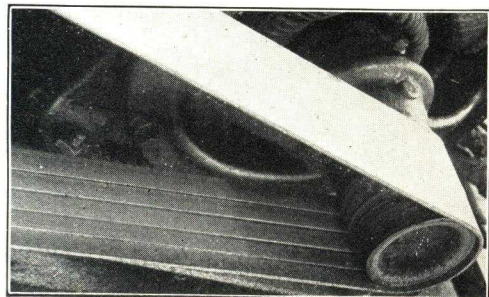
All prices are f.o.b. manufacturers' shipping point with full freight allowances on shipment of 100 lbs. or more. Discounts on request.

Fabreeka Channel Belts**For Heavy Transmission and Short Center Drives**

FABREEKA Channel Belts are specially designed for short center drives with pulleys of wide difference of diameter and where heavy belts must be used on small pulleys. The inherent gripping power of FABREEKA previously described is still further increased by longitudinal channels. These channels add to the pliability and life of the belt and permit the use of smaller pulleys.

FABREEKA Channel Belts are recommended for: Short Center Drives; Heavy Transmission; Compressors; Pumps; Fans; Heavy Cutting Machines; Cotton and Silk Spinning Frame Drives; Oil Field Pumps; Railway Car Lighting and Air Conditioning; Paper Mills; Cotton Mills; Cement Plants; Steel and Forge Plants; Chemical Plants; Automobile Plants; Food Industries, etc.

Further information and complete data furnished on request.



Left:

Fabreeka Channel Belt Driving Dynamo Without Idler or Guides

All slip eliminated and perfect performance registered on voltmeter even after many months of continuous operation



Section of Fabreeka Channel Belt Showing the Longitudinal Channels

THE GATES RUBBER COMPANY

Gates Vulco V-Belt Drives

999 So. Broadway, DENVER, COLO.

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HOBOKEN, N. J., Hoboken Terminal Building

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SAN ANTONIO, TEX., 915 Edison Drive
SAN FRANCISCO, CAL., 57 California St.
SEATTLE, WASH., 206 First Avenue, So.
SPRINGFIELD, MASS., 818 Belmont Ave.
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SYRACUSE, N. Y., 405 Westcott St.
TOLEDO, OHIO, 605 Michigan St.
TAMPA, FLA., 407 So. Florida Ave.
TULSA, OKLA., 1023 E. 17th Place
WICHITA, KAN., 739 No. Main St.

Products

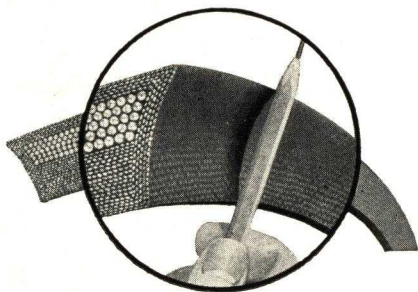
GATES VULCO ROPES:
For multiple "V," V-Flat and
Quarter-Turn Drives.

GATES VULCO CORD BELTS:
A superior belt for light machin-
ery drives.

GATES DUBL-V BELTS:
For power transmission to
sheaves from top and bottom of belt.

Construction of Gates Vulco V-Belts

Concave Sidewalls—All Gates Vulco Ropes and Vulco Cord Belts are molded with slightly concave sidewalls. As the



Gates Belt bends around the sheaves, the sidewalls straighten out to a firm and uniform contact against the sides of the sheave groove. This feature is important because it makes possible the transmission of more hp. with minimum belt tension.

Rubber-Filled Cords—Dry cotton cords are passed through a bath of liquid rubber (Latex) and then dried. Not only does a thin film of pure rubber surround each cord, but what is even more important, the rubber penetrates inside the cord and binds together the individual fibers. This patented, rubber-filling process prevents internal chafing and accounts for the long life of Gates Belts on the most severe drives.

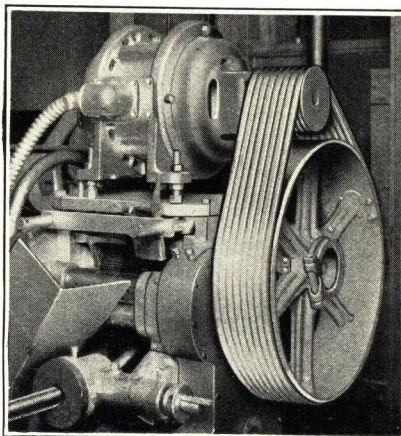
Bias-Cut Cover—A strong and flexible multiple ply cover of bias-cut friction fabric protects the inner core of the belt from dirt and moisture and resists the action of oil.

Gates Vulco V-Flat Drives

Gates Vulco V-Flat Drives have definite advantages over other types of power transmission equipment. Among these are:

- Positive transmission of power.
- High efficiency.
- Dependability.
- Cleanliness.
- Quietness.
- Compactness.
- Shock-absorbing characteristics.
- Ease of installation.
- Low maintenance cost.

All the advantages of a V-Belt Drive may be obtained with a Gates Vulco V-Flat Drive, and with ratios greater than 2:1 or 3:1 the cost is much less.

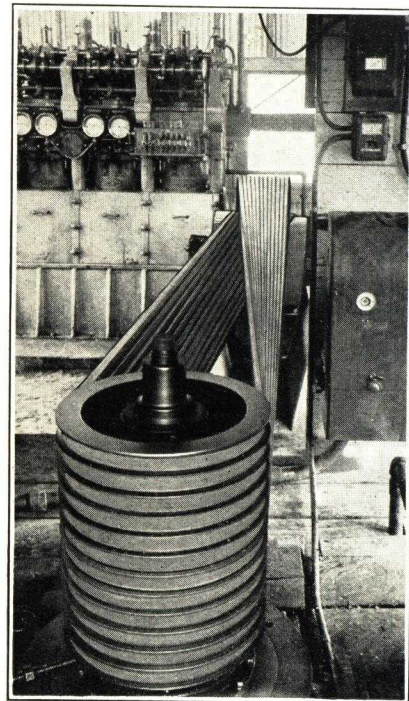


5 Hp. V-Flat Drive on Lead Stripping Machine

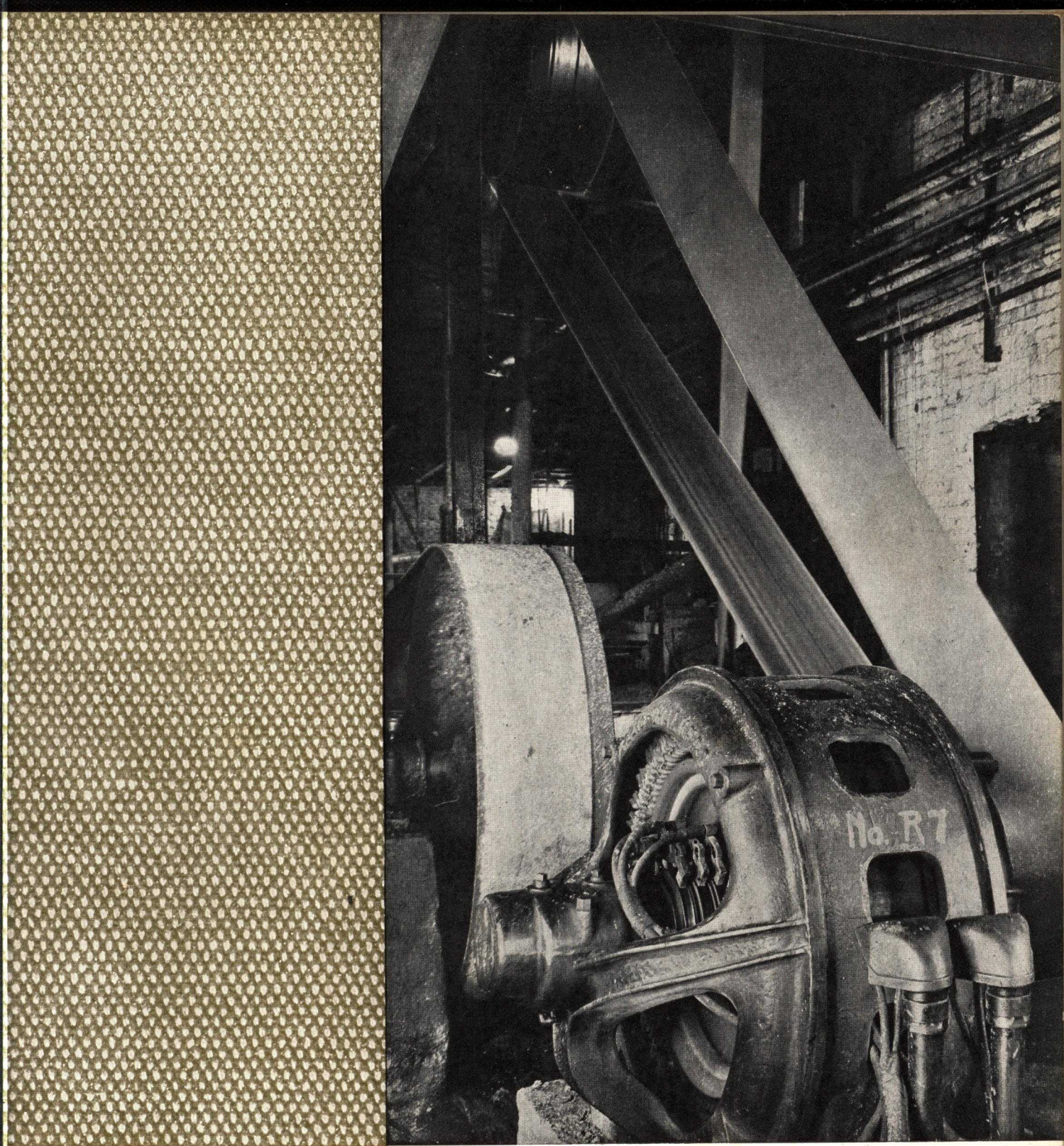
Gates Vulco Quarter-Turn Drives

Gates Vulco Ropes are more satisfactory than gears on Quarter-Turn Drives because they are clean and quiet, and because they absorb shocks.

They are more satisfactory than flat belts because they operate on shorter centers with no slippage.



Twelve 600D Vulco Ropes on Quarter-Turn Drive from 150 Hp. Diesel Engine to Deep Well Pump



B.F. Goodrich

Engineering Data, Industrial Rubber Goods

A GUIDE TO SELECTION OF BELTING, HOSE AND OTHER PRODUCTS • •



THE B. F. GOODRICH RUBBER CO.

Manufacturers of Mechanical Rubber Goods Since 1870

AKRON, OHIO

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DALLAS, 4136 Commerce St.
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EXPORT: THE INTERNATIONAL B. F. GOODRICH CORPORATION

For Distributors of Goodrich Mechanical Rubber Goods, see page 25

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Automobile tires, tubes, accessories
Battery jars and containers
Billiard table cushions
Bradley hammer cushions
Channel rubber
Corks and stoppers
Crude rubber, washed and milled
Dredging sleeves
Drug sundries

Engraving gum
Footwear
Forming tanks and racks
Grease hose
Grinding mill liners
Hard rubber goods—special
Heels, soles and taps
Hydraulic brake hose
Milking machine parts
Mill and calender aprons

Molded goods—special
Municipal fire department hose
Offset lithographers' blankets
Oil well drilling and pumping ac-
cessories
Paper machinery parts
Pipe line rings
Pipe—hard rubber
Plumbing equipment parts
Printers' rollers

Railroad equipment hose and
belting
Shoe cloth
Stamp gum
Surgical goods
Tanners' bolsters
Thread
Tiling
Type gum
Typewriter platens



GOODRICH TRANSMISSION BELTING

FACTS ABOUT RUBBER BELTING

The best rubber belting today, as represented by Goodrich Highflex, is more than twice as good as the best rubber belt 10 years ago. It is 60% cotton. Rubber is forced into the weave of the cotton under 14 tons per square foot pressure. No other filler compares with rubber in permanent elasticity. Rubber is superior in resistance to wear and moisture. Since the cotton is sealed by rubber the belt operates with much less stretching or shrinking than other belt materials.

Rubber belting averages 40% lower in first cost than leather belting. Rubber belting is uniform in thickness, width and weight. It is made straight and runs straight.

TABLE NO. 1—DATA AND LIST PRICES—HEAVY RUBBER BELTS

Size of belt, in. ply	*Horsepower capacity at						**Minimum pulley diameter, in., at			Leather belt equivalent	List price per foot
	1000 F.P.M.	2000 F.P.M.	3000 F.P.M.	4000 F.P.M.	5000 F.P.M.	6000 F.P.M.	1000 F.P.M.	3000 F.P.M.	5000 F.P.M.		
1 — 3	1.2	2.5	3.7	5	5.3	5.1	2	3	4	Single	\$0.20
1½ — 3	1.8	3.7	5.5	7.5	7.9	7.7	2	3	4	Light single	.31
1½ — 4	2.5	5	7.5	10	10.6	10.3	4	5	6	Heavy single	.36
2 — 3	2.5	5	7.5	10	10.6	10.3	2	3	4	Light single	.39
2 — 4	3.3	6.7	10	13	15	14	4	5	6	Heavy single	.46
2½ — 3	3.1	6.2	9.4	12.5	14	13	2	3	4	Light single	.48
2½ — 4	4.2	8.4	12.5	16.5	18.5	17.5	4	5	6	Heavy single	.56
3 — 3	3.8	7.5	11.3	14.8	16	15.4	2	3	4	Light single	.55
3 — 4	5	10	15	20	22	21	4	5	6	Heavy single	.65
3½ — 4	5.8	11.6	17.5	23.5	25.5	24.5	4	5	6	Heavy single	.76
3½ — 5	7	15	22	30	32	31	6	8	10	Double	.95
4 — 3	5	10	15	20	22	21	2	3	4	Light single	.70
4 — 4	6.7	13	20	26	28	27	4	5	6	Heavy single	.82
4 — 5	8.3	17	25	34	36	35	6	8	10	Double	1.03
4½ — 4	7.5	15	22.5	30	32	31	4	5	6	Single	.92
5 — 4	8.3	17	25	34	36	35	4	5	6	Single	1.02
5 — 5	11	21	31	42	44	43	6	8	10	Double	1.28
6 — 4	10	20	30	40	42	41	4	5	6	Single	1.22
6 — 5	13	25	38	50	53	52	6	8	10	Double	1.53
6 — 6	15	30	45	60	64	62	10	12	15	Heavy double	1.83
7 — 4	11.7	23	35	46	48	47	4	5	6	Single	1.43
7 — 5	15	29	45	58	62	61	6	8	10	Double	1.79
8 — 4	13	27	40	53	57	55	4	5	6	Single	1.54
8 — 5	17	33	50	66	71	69	6	8	10	Light double	1.93
8 — 6	20	40	60	80	86	84	10	12	15	Double	2.31
8 — 7	23.2	46.7	70	93	100	97	14	17	21	Double	2.70
8 — 8	26.5	53.5	80	106	114	111	17	22	27	Triple	3.08
10 — 5	21	42	62	83	89	87	6	8	10	Light double	2.40
10 — 6	25	50	75	99	106	103	10	12	15	Double	2.88
10 — 7	29	58	88	115	123	119	14	17	21	Heavy	3.36
10 — 8	33	66	101	131	140	135	17	22	27	Triple	3.84
12 — 5	25	50	75	99	106	103	6	8	10	Light double	2.88
12 — 6	30	60	90	119	127	123	10	12	15	Double	3.45
12 — 7	35	70	105	139	148	144	14	17	21	Double	4.03
12 — 8	40	80	120	159	170	165	17	22	27	Triple	4.60
14 — 6	35	70	105	139	148	144	10	12	15	Double	4.04
14 — 7	41	82	122	162	174	168	14	17	21	Heavy double	4.71
14 — 8	47	93	140	186	200	194	17	22	27	Triple	5.38
16 — 6	40	80	120	159	170	165	10	12	15	Double	4.62
16 — 8	53	107	160	213	229	222	17	22	27	Triple	6.16
18 — 6	45	90	135	180	192	186	10	12	15	Double	5.20
20 — 8	66	134	200	266	284	276	17	22	27	Triple	7.68

Endless Belts—For belts built endless at the factory, add the price of ten extra feet.

***Horsepower**—Applies to Highflex, Commander or Drivesall. Calculated for 180 degrees of contact on smaller pulley—deduct 10% for 160 degrees; add 10% for 200 degrees; 15% for 220 degrees. Deduct 10% if smaller pulley is less than 8 in. diameter.

Overload—Maximum horsepower should be the guide. If overload of motor is not known, add 25% to 50% to horsepower rating on motor plate. To convert kilowatts to horsepower, multiply by 1.34. Extra margin should be allowed in selecting belts for vertical drives, cone drives, crossed drives, tight side above, excessive dust, water or other conditions which impair full, smooth pulley contact.

****Minimum Pulley Diameter**—Table applies to Highflex belts joined with fasteners. For factory built endless belts, pulleys may be 10% smaller. Pulleys should be 10% larger for Commander belts; 20% larger for Drivesall belts.

F.P.M.—To figure speed of belt in feet per minute (F.P.M.), multiply diameter of pulley in inches by revolutions per minute (R.P.M.) of the same pulley, and then divide by 3.8.

Other Sizes—Table shows most commonly used sizes of rubber belts. Horsepower and prices of intermediate and larger sizes are in proportion. Belts can be furnished in sizes up to 60 in. 12 ply.



HIGHEST QUALITY TRANSMISSION BELTING for SEVERE SERVICE:

HIGHFLEX

Goodrich Highflex was the original "raw edge" heavy duty rubber belt. Its success is indicated by numerous imitations of its appearance and construction. It has been progressively improved so that Highflex incorporates the latest research and development in transmission belting. Its successful performance is due chiefly to the tan Highflex rubber with which the belt is impregnated. This rubber is scientifically compounded to withstand constant flexing, heat and wear, without loss of sealing properties or permanent elasticity.



Fig. 1

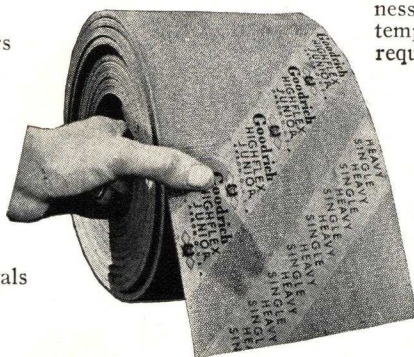


Fig. 2

The unhampered action of the Highflex construction can be demonstrated by bending several layers of paper with the fingers (Fig. 1). When viewed from the edge, they assume a natural uniform curve. On the other hand, if the sheets are folded and then bent (Fig. 2), it will be noticed that the fold distorts the curve and impedes free movement of the individual layers to a marked degree.

For the past eight years Highflex has made outstanding performance records in all industries on difficult drives including:

Cone Pulleys	Air Compressors
Dryer Sections	Extractors
Water Pumps	Planers
Beaters	Edgers
Dry Pans	Gang Saws
Pug Mills	Hogs
Blowers	Grinders
Tube Mills	Lathes
Crushers	Mine Pumps
Fans	Hot Saws
Ball Mills	Cold Saws
Oil Well Drilling and Pumping	Sugar Centrifugals
	Looms



FOR TEXTILE MACHINERY, MACHINE TOOLS,
FLOUR MILLS, ETC.:

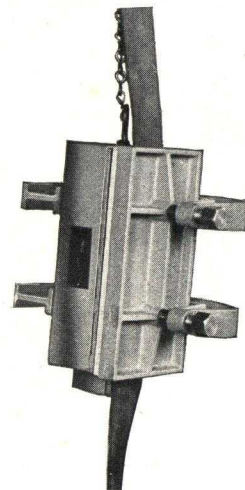
HIGHFLEX JUNIOR

Highflex Junior is designed to replace leather belts in the narrower widths—up to 6 in. It is similar to its older brother, Highflex, except that it is made of a special cotton duck. This special duck construction is adapted to easy splicing by step joints, which can be vulcanized endless on the pulleys by the user with a simple portable electric vulcanizer. May also be joined effectively with wire lacings or other metal fasteners. Highflex Junior incorporates the same seamless square edge construction as regular Highflex and is impregnated with the same Highflex rubber. Absolutely uniform in thickness and weight.

Highflex Junior is made in weights corresponding to leather belt thicknesses. Prices on vulcanizers, templates and tools quoted on request.

LIST PRICES HIGHFLEX JUNIOR BELTING (Standard Leather List)

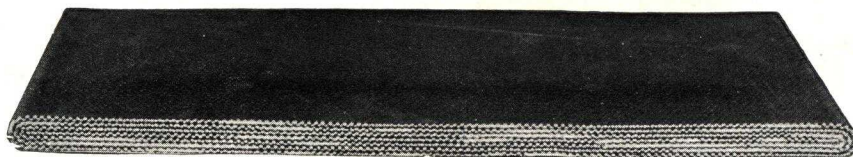
Size, in.	Single	Double
1	\$0.24	\$0.48
1½	.36	.72
2	.48	.96
2½	.60	1.20
3	.72	1.44
3½	.84	1.68
4	.96	1.92
4½	1.08	2.16
5	1.20	2.40
5½	1.32	2.64
6	1.44	2.88



Heintz Electric Vulcanizer
Completing Highflex Junior
Belt Joint on Pulleys Two
Hours After Job Is
Started

FOLDED EDGE TRANSMISSION BELTING: COMMANDER

Leading Goodrich brand prior to introduction of Highflex. Highest quality throughout. 32-oz. duck. Gray friction surface. Cost is approximately 20% below Highflex.



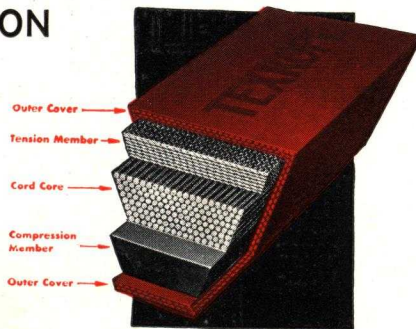
DRIVESALL

A dependable quality, red friction surface grade, built on 32-oz. duck. Used on average drives. Cost is approximately 30% below Highflex.



"V" TYPE TRANSMISSION BELTING

Texrope Belts for multiple drives are made by Goodrich under Allis-Chalmers patents for original equipment or replacements on Allis-Chalmers Texrope drives. Replacement orders need specify only the belt serial number as it appears on the old belt, e.g., serial number 71-A.



DIRECTIONS FOR ORDERING TRANSMISSION BELTS

Full rolls contain one continuous piece approximately 450 feet to 570 feet long; half rolls 225 to 290. Belts may also be ordered in exact length for individual drives.

When in doubt as to belt required for given drive, submit as much as possible of the following information:

- Length of belt, or distance between shaft centers
- Dimensions of all pulleys
- Revolutions per minute of at least one pulley
- Is tight or driving side of belt on top or bottom
- Horsepower—maximum and average
- Is drive pulley on a motor, engine, or shaft
- If on motor or engine, give horsepower rating
- Overload per cent in starting—in running
- Machine or machines driven

Unusual conditions such as excessive oil, fumes, moisture, fork shifters, flanges on pulleys, dust, heat, misalignment.

Type of drive—indicate by a number in the adjoining Goodrich chart of belt drives.

Type of belt previously used, length of service, and troubles experienced, if any.

ENDLESS BELTS

All trouble with fasteners or splices is eliminated by having endless belts made to order for your drive. By a special Goodrich process these belts are actually built in the factory in one piece with no weak spots or splices. In ordering, specify exact steel tape measurement around the pulleys. If there is an idler, take measurement with idler in normal position. Goodrich district offices will make necessary allowances for stretch in entering factory order. Endless belts are subject to a manufacturing tolerance of three fourths of one per cent plus or minus required length. Minimum thickness of endless belts is three ply for Highflex and four ply for folded construction belts.

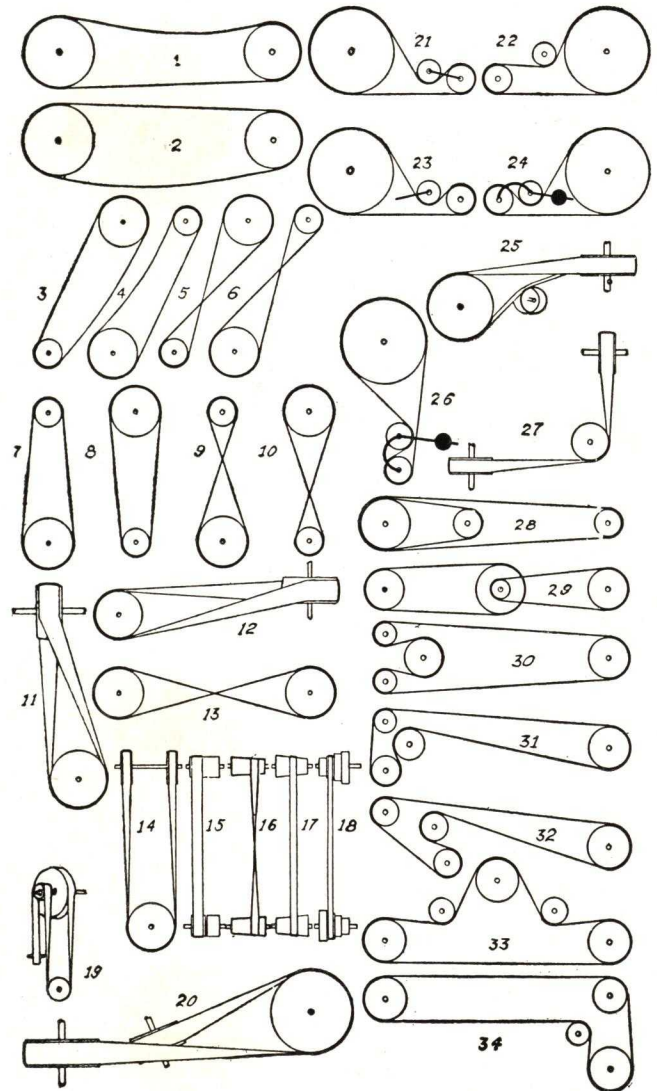
HOW TO INSTALL

If belt is to operate under atmospheric conditions decidedly different from those in which the belt was stored, satisfactory performance will be insured by loosening the belt, if a roll, and conditioning it by exposing it to the atmosphere in the room where it is to operate, for at least 48 hours before cutting to length.

After belt is properly "conditioned," correct tension is given

DRESSING FOR RUBBER BELTS: GOODRICH PLASTIKON BELT DRESSING

Made in stick form—one pound per stick. Contains no grease or other ingredients harmful to rubber. A very small quantity immediately imparts gripping power to glazed surfaces of old belts. List price \$1.00 per pound.



by allowing 1% for stretch—that is by cutting $\frac{1}{8}$ in. per ft. on length shorter than steel tape measurement around the pulleys. (For vertical drives, allow $\frac{1}{16}$ in. per ft. instead of $\frac{1}{8}$ in.)

Make ends square and use steel square as guide in cutting.

When using rawhide lacing make punch holes as small as possible. When using wire lacing or metal fasteners be sure to employ the size recommended by the manufacturer of lacing for the thickness of the belt and the diameter of the pulleys.

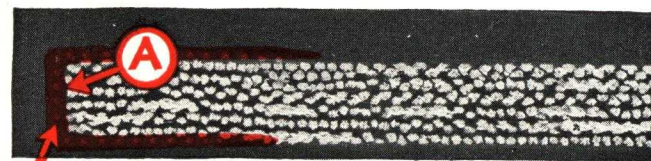


GOODRICH CONVEYOR BELTING

The difference in various qualities of Goodrich Conveyor Belts lies in the quality of the elastic rubber friction with which the cotton fabric is impregnated, also in the quality of the rubber cushion which constitutes the covers and edges. The quality of friction rubber is not merely a matter of adhesion but of retaining a permanent elasticity. The quality of the cover compounds differ according to their capacity to withstand abrasion, heat, corrosion, etc.

The Highflex Edge—All grades of Goodrich conveyor and elevator belt 12 in. and over, 4 ply or thicker, with one cover $\frac{1}{16}$ in. or thicker, are made with the "Highflex bonded edge." Each ply of fabric is terminated at the edge, without folds. This eliminates nearly all seams. The edge cushion is molded square

and bonded to the plies by a layer of open-mesh breaker fabric. This unique feature assures firm adhesion of edge cushion to resist gouging and other abuse at this most vulnerable point of a conveyor belt.



Section at Edge of Goodrich Belt

- A. Each ply a separate unit—no folds.
B. Open-mesh breaker fabric insures perfect union of edge cushion with body of belt.

Red Lines in Cuts Indicate Cord Breaker Fabric

STANDARD QUALITY FOR GENERAL SERVICE:

MAXECON

Name denotes "maximum economy." 28-oz. duck in all widths unless 32 oz. is specified.



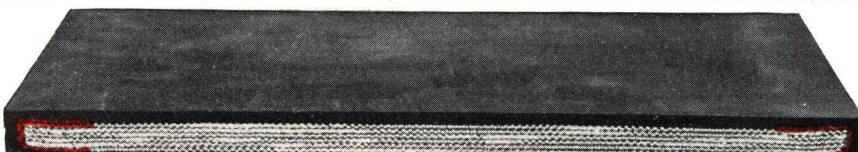
LIST PRICES ON SIZES OF MAXECON CONVEYOR BELT (28-OUNCE DUCK) CARRIED IN FACTORY STOCK

Width, in.	No. of plies	Thickness, in.		List price per foot	Width, in.	No. of plies	Thickness, in.		List price per foot	Width, in.	No. of plies	Thickness, in.		List price per foot
		Top cover	Bottom cover				Top cover	Bottom cover				Top cover	Bottom cover	
12	4	$\frac{1}{16}$	$\frac{3}{32}$	\$1.39	18	4	$\frac{1}{8}$	$\frac{1}{8}$	\$2.62	24	5	$\frac{1}{8}$	$\frac{1}{8}$	\$3.77
14	4	$\frac{1}{16}$	$\frac{3}{32}$	1.64	18	5	$\frac{1}{8}$	$\frac{3}{32}$	2.83	24	5	$\frac{1}{8}$	$\frac{1}{8}$	4.00
14	4	$\frac{3}{32}$	$\frac{3}{32}$	1.76	20	4	$\frac{1}{8}$	$\frac{3}{32}$	2.32	24	6	$\frac{1}{8}$	$\frac{1}{8}$	4.28
16	4	$\frac{1}{16}$	$\frac{3}{32}$	1.86	20	5	$\frac{1}{8}$	$\frac{3}{32}$	2.75	30	5	$\frac{1}{8}$	$\frac{3}{32}$	4.71
16	4	$\frac{3}{32}$	$\frac{3}{32}$	2.00	20	5	$\frac{1}{8}$	$\frac{3}{32}$	3.14	30	6	$\frac{1}{8}$	$\frac{3}{32}$	5.36
16	4	$\frac{1}{8}$	$\frac{3}{32}$	2.16	24	4	$\frac{1}{8}$	$\frac{3}{32}$	2.78	36	6	$\frac{1}{8}$	$\frac{3}{32}$	6.43
16	5	$\frac{1}{8}$	$\frac{3}{32}$	2.52	24	4	$\frac{1}{8}$	$\frac{3}{32}$	3.25	42	4	$\frac{1}{8}$	$\frac{3}{32}$	4.89
18	4	$\frac{1}{8}$	$\frac{3}{32}$	2.09	24	4	$\frac{1}{8}$	$\frac{3}{32}$	3.49	42	5	$\frac{1}{8}$	$\frac{3}{32}$	5.77
18	4	$\frac{1}{8}$	$\frac{3}{32}$	2.43										

EXTRA QUALITY FOR GENERAL SERVICE:

2002

Same quality fabric carcass as Maxecon but with higher grade cover, 28 or 32-oz. duck. Cost averages approximately 5% above Maxecon.



2002

SUPER QUALITY FOR SEVERE SERVICE:

LONGLIFE

Superior quality friction with extra tough cover for handling ore, sharp rock, wet gravel and other severe duty. Made on 28-oz. or 32-oz. duck, as specified by the buyer. Cost averages approximately 12% above Maxecon.



Longlife

SUPREME QUALITY FOR HEAVIEST DUTY:

SUPER LONGLIFE

For unusually severe or abusive service in mines and rock product plants, also for handling coke. The cover is Armorite rubber, the toughest known rubber compound with superlative quality friction. Built on 28, 32 or 36-oz. duck, as specified by the buyer. Extra reinforcement of breaker fabric inserted in cover to insure against damage. Cost averages approximately 22% above Maxecon.



Super Longlife

SPECIAL QUALITY FOR HIGH TEMPERATURES: GOODRICH HOT MATERIAL

The friction and cover are especially compounded for heat resistance, particularly for small size materials. Made in various weights of duck. Cost averages approximately 5% above Maxecon.

FOR SERVICE RECOMMENDATIONS SEE PAGE FOLLOWING

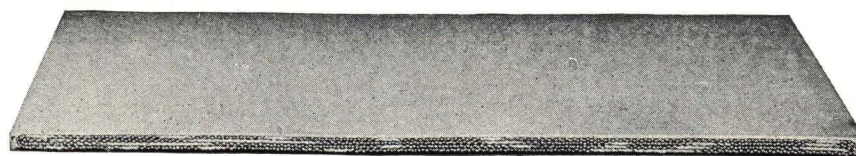


FOR FOOD PRODUCTS: WHITE COVER

For handling bulk fruits and vegetables in canning factories. Cream white rubber cover resists fruit juices and promotes cleanliness.

Built on 24 oz. or 28 oz. duck.

Cost averages approximately 15% above Maxecon.



SPECIAL QUALITY FOR GRAIN HANDLING: CARIGRAIN

Especially designed for service in large grain elevators.

Built on 28 oz. duck.

Cost averages approximately the same as Longlife grade.

PULLEY LAGGING

Pulley lagging is made like a conveyor belt without a back cover. Two plies of duck and rubber cover $\frac{1}{8}$ in. thick. Can also be furnished with $\frac{1}{16}$ in. cover. Applied to pulley with countersunk bolts.

BREAKER FABRIC IN COVERS

When belt covers are subject to severe gouging, we recommend that orders specify "Breaker fabric in top cover." This can be provided at no increase in cost. This serves to "tie" the cover to the carcass. The position of the breaker fabric is illustrated by the red lines in the cuts. It is always used for Super Longlife and can be furnished in Maxecon, 2002, Longlife and Hot Material, when specified, at no extra charge.

STEPPED PLY CONSTRUCTION

Any grade of rubber covered conveyor belt can be furnished in this construction when specified. It affords a thicker cover of rubber in the middle of the belt because the plies of fabric are eliminated at this point. Inasmuch as this detracts from the working strength of the belt, this construction is not recommended when lengthwise tension on belt is very high.

Price is the same as the average plies and cover thickness of regular construction.



REINFORCED COVER

Rubber cover is built up to extra thickness in the middle of the belt. Recommended for conditions where severe abrasion tends to wear out the belt rapidly in the middle. Not suitable for tandem drives.



CONVEYOR BELT SERVICE RECOMMENDATIONS

Selection of the grade of conveyor belt to afford best economy on a given installation is a complex problem. For new installations we recommend that all conditions be submitted to Goodrich engineers for special recommendations. In the case of replacements, an examination of the old belt will serve as the best guide. If it stretched excessively more plies are needed. If top or bottom covers, or both, wore out while the fabric carcass was intact, better quality or thicker covers are indicated. If plies are separated a higher quality friction would prove economical.

The requirements of a belt are determined not only by the nature of the material, but also nature of feed, length of conveyor, alignment, tripper and tension. Exposure to elements, condition of idlers, care in lubrication are all features to be considered. If the loading and mechanical conditions are ideal, Maxecon grade can be used even for heavy materials. With unfavorable mechanical conditions Super Longlife might be required to resist abuse even for light materials.

Generally speaking the various grades are most commonly used for the following conditions:

MAXECON

Ashes	Coal	Hog Fuel	Snow
Brick (except off-bearing)	Wet Concrete	Plaster of Paris	Crushed Stone
Small Castings	Earth	Refuse	Sulphur
Bagged Cement	Garbage	Salt	Vegetables
Finished Cement	Boxed Material	Sand	Wood Chips
Clay	Dry Gravel	Crushed Shale	Wood Pulp

2002 GRADE

Ashes	Grading and Ditching Machines	Iron Ore	Soda Ash—Cold
Castings	Gravel	Limestone up to 8 in.	Crushed Stone
Wet Char	Glass—Fine Cullet	Sand	Dry Refined Sugar
Coal		Crushed Shale	Tailings
Wet Concrete		Slag	Trap Rock
Earth			

LONGLIFE

Ashes	Anthracite Coal	Limestone up to 8 in.	Raw Sugar
Castings	Glass—Fine Cullet	Slag	Wet Refined Sugar
Wet Char	Gold Ore	Crushed Stone	Tailings
Copper Ore	Wet Gravel	Lump Stone	Trap Rock
Cosettes	Iron Ore	Dry Refined Sugar	
Gold Dredging			

SUPER LONGLIFE

Coke	Glass—Coarse Cullet	Poidometers	Slag
Copper Ore	Limestone 8 in. and over	Coal Projectors	Lump Stone
Gold Dredging		Quartz	Tailings
Gold Ore			

HOT MATERIAL

Generally designed for fine or medium materials which heat the belt up to a temperature of 150° or over, but not more than 200° F.—including cement clinker, hot char, fullers' earth, phosphate, soda ash, sinter, salt, crushed stone, etc.



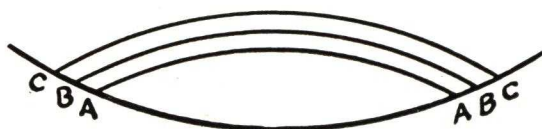
CONVEYOR BELT DATA

WIDTH

For fine material, width is determined by required capacity. For lump material, the chute must be large enough to prevent choking and the belt correspondingly wider.

TABLE NO. 2

Width of belt, in.....	12	18	24	30	36	42	48
Uniform sized material, in..	1½	3	4½	7	9	11	14
Maximum pieces unsized material, in.....	2	4	8	14	18	20	24



How Reduced Speed Saves Belts

Cross section of 24-in. belt carrying 140 tons of crushed coal per hour.

AA = Size of load at 500 ft. per minute.

BB = Size of load at 400 ft. per minute.

CC = Size of load at 300 ft. per minute.

When fully loaded at CC the belt passes under the loading chute ¾ as often as when loaded at AA, with 40% less wear on the rubber cover.

SPEED

Speed should be the slowest that will carry the load, thus keeping the belt full and reducing breakage of material and wear of belt. Maximum speed in average practice is indicated by the following table:

Feet per minute.....	Width		Over 36 in. 600
	Up to 16 in. 300	24 in. 450	

NUMBER OF PLIES

Table No. 3 below will assist in determining the required number of plies to withstand tension and thereby avoid excessive stretch.

When tension is not a factor, it is necessary to have only enough plies to impart sufficient body so that the belt will not crease between idler pulleys. Sizes listed in Column A, Table No. 3, represent good practice for all except very light materials. In grain belts 4-ply is good practice for widths up to 36 in.

EXPLANATION OF TABLE

DUCK WEIGHT (Column B)

Refers to number of ounces per yard of cotton duck 42 in. wide. Except for extreme tension on very heavy materials, 28-oz. duck is good practice in all belts 30 in. wide and under,

TABLE NO. 3, CONVEYOR BELT DATA

Belt		C Maximum working tension, lbs.	D Maximum tons per hour at 100 ft. per minute		E Horsepower required per ft. center to center distance at 100 f.p.m. belt speed				F Horsepower required per ft. vertical lift 100 f.p.m. belt speed		G Maximum horsepower of belt at 100 f.p.m.				H Spacing of idlers top row, in.			
					Plain bearings		Roller bearings		Coal	Stone	Coal	Stone	Simple drive				Tandem drive	
					Coal	Stone	Coal	Stone					Bare pulleys	Lagged pulleys			Bare pulleys	Lagged pulleys	Coal	Stone
A Width and plies	B Weight of duck		Coal	Stone	Coal	Stone	Coal	Stone	Coal	Stone	Bare pulleys	Lagged pulleys	Bare pulleys	Lagged pulleys	Coal	Stone		
12-4 ply	28	1200	12	24	.0029	.0036	.0019	.0024	.012	.024	2	2.3	3	3.3	60	54		
14-4 "	28	1400	16	33	.0036	.0047	.0024	.0031	.016	.033	2.3	2.7	3.5	3.9	60	54		
16-4 "	28	1600	21	43	.0043	.0056	.0029	.0037	.021	.043	2.7	3	4.1	4.4	60	54		
16-5 "	28	2000	21	43	.0043	.0056	.0029	.0037	.021	.043	3.3	3.8	5.1	5.5	60	54		
18-4 "	28	1800	27	54	.0054	.0070	.0036	.0047	.027	.054	3	3.4	4.6	5	54	48		
18-5 "	28	2250	27	54	.0054	.0070	.0036	.0047	.027	.054	3.8	4.3	5.7	6.2	54	48		
20-4 "	28	2000	33	66	.0063	.0084	.0042	.0055	.033	.066	3.3	3.8	5.1	5.5	54	48		
20-5 "	28	2500	33	66	.0063	.0084	.0042	.0055	.033	.066	4.2	4.8	6.3	6.9	54	48		
24-4 "	28	2400	48	96	.0083	.0112	.0056	.0075	.048	.096	4	4.6	6.1	6.6	48	42		
24-5 "	28	3000	48	96	.0083	.0112	.0056	.0075	.048	.096	5	5.8	7.6	8.3	48	42		
24-6 "	28	3600	48	96	.0083	.0112	.0056	.0075	.048	.096	6	6.9	9.1	9.9	48	42		
24-7 "	28	4200	48	96	.0083	.0112	.0056	.0075	.048	.096	7	8	10.7	11.6	48	42		
24-7 "	32	4630	48	96	.0083	.0112	.0056	.0075	.048	.096	7.4	8.4	11.2	12.2	48	42		
30-5 "	28	3750	75	150	.0116	.0161	.0077	.0107	.075	.150	6.3	7.2	9.5	10.4	48	42		
30-6 "	28	4500	75	150	.0116	.0161	.0077	.0107	.075	.150	7.5	8.6	11.4	12.4	48	42		
30-6 "	32	4950	75	150	.0116	.0161	.0077	.0107	.075	.150	7.9	9	12.0	13	48	42		
30-6 "	36	5400	75	150	.0130	.0175	.0087	.0117	.075	.150	8.3	9.5	12.5	13.7	48	42		
30-7 "	28	5250	75	150	.0130	.0175	.0087	.0117	.075	.150	8.9	10	13.3	14.5	48	42		
30-7 "	32	5780	75	150	.0130	.0175	.0087	.0117	.075	.150	9.2	10.5	14	15.2	48	42		
36-5 "	28	4500	108	216	.0179	.0244	.0119	.0162	.108	.216	7.5	8.6	11.4	12.4	42	36		
36-6 "	28	5400	108	216	.0179	.0244	.0119	.0162	.108	.216	9	10.3	13.7	14.9	42	36		
36-6 "	32	5940	108	216	.0179	.0244	.0119	.0162	.108	.216	9.5	10.8	14.4	15.7	42	36		
36-6 "	36	6480	108	216	.0179	.0244	.0119	.0162	.108	.216	9.9	11.4	15	16.4	42	36		
36-7 "	28	6300	108	216	.0179	.0244	.0119	.0162	.108	.216	10.5	12	16	17.4	42	36		
36-7 "	32	6830	108	216	.0179	.0244	.0119	.0162	.108	.216	11	12.6	16.8	18.3	42	36		
42-6 "	32	6940	147	294	.0226	.0314	.0150	.0209	.147	.294	11	12.6	16.8	18.3	42	36		
42-6 "	36	7560	147	294	.0226	.0314	.0150	.0209	.147	.294	11.6	13.3	17.5	19	42	36		
42-7 "	32	8100	147	294	.0226	.0314	.0150	.0209	.147	.294	12.9	14.7	19.6	21.4	42	36		
42-7 "	36	8820	147	294	.0226	.0314	.0150	.0209	.147	.294	13.5	15.5	20.4	22.2	42	36		
48-6 "	32	7900	192	384	.0281	.0395	.0186	.0263	.192	.384	12.6	14.4	19.2	20.8	42	36		
48-6 "	36	8640	192	384	.0281	.0395	.0186	.0263	.192	.384	13.2	15.2	20	21.8	42	36		
48-7 "	32	9250	192	384	.0281	.0395	.0186	.0263	.192	.384	14.7	16.8	22.4	24.4	42	36		
48-7 "	36	10100	192	384	.0281	.0395	.0186	.0263	.192	.384	15.4	17.7	23.4	25.4	42	36		
48-8 "	32	10560	192	384	.0281	.0395	.0186	.0263	.192	.384	16.8	19.2	25.6	27.8	42	36		
48-8 "	36	11520	192	384	.0281	.0395	.0186	.0263	.192	.384	17.6	20.2	26.6	28	42	36		



32-oz. in wider belts. 36-oz. duck is advantageous for heavy rock and ore in extremely wide belts. A special 42-oz. Goodrich duck is now available for extreme tensions.

MAXIMUM WORKING TENSION (Column C)

Based on a unit tension of 25 pounds per inch of width per ply for 28-oz. duck, 27½ pounds for 32-oz. duck and 30 pounds for 36-oz. duck.

MAXIMUM TONS PER HOUR (Column D)

Table is based on short tons of 2000 lbs. Capacity is proportional to speed. Values given for coal are based on a weight of 50 lbs. per cubic foot; for stone 100 lbs. per cubic foot. These capacities allow for some irregularity of feed but are based on a troughed belt loaded 80% of the belt width, as indicated by arc CC in cut at left. If not possible to run belt full, a corresponding margin should be allowed in selecting a width of belt to insure the desired delivery.

HORSEPOWER REQUIRED

The total horsepower required for a fully loaded belt is the sum of the following:

To Overcome Bearing Friction—Multiply values in Column E by the length of conveyor in feet (center to center).

To Lift the Load—Multiply values in Column F by the number of feet difference in elevation between head and tail pulleys. Add five feet for each tripper.

MAXIMUM HORSEPOWER OF BELT (Column G)

These values indicate the maximum horsepower the belt is capable of handling without excessive stretch.

EXAMPLE

What belt would be required to carry 160 tons per hour of crushed coal (maximum size 6 in.), a distance of 400 ft. to an elevation of 75 ft.?

Table No. 2 indicates a minimum width of 24 in. for 6 in. lumps. Column D in Table No. 3 shows that a 24 in. belt will carry 48 tons per hour at 100 f.p.m. It is decided to operate

the belt at 400 ft. per minute, which would provide a capacity of 192 tons per hour, allowing a reasonable margin over the required 160 tons. The next step is to compute the horsepower required. For plain bearings this would be .0083 (Column E) x 400 (center to center distance in feet) equals 3.32 (horsepower required to overcome friction at 100 ft. per minute). Add to this .048 (Column F) x 75 (feet of vertical lift) equals 3.6 (horsepower required to lift the load at 100 ft. per minute). 3.32 plus 3.6 equals 6.92 (total horsepower required at 100 ft. per minute). At 400 ft. per minute the required horsepower would be 27.68. In comparing this amount with maximum belt horsepowers in Column G we find it will be necessary to use a five-ply belt with tandem drive, bare pulleys, this belt having a horsepower capacity of 7.6 at 100 ft. per minute or 30.4 horsepower at 400 ft. per minute.

On the other hand, if roller bearings are used, the required horsepower to overcome friction would be .0056x400 equals 2.24. Substituting this value for 3.32 in the foregoing calculation, we have a total required horsepower at 100 ft. per minute of 5.84, permitting us to use a simple drive with lagged pulleys.

TOP COVERS

For fine, light materials ⅜ in. is sufficient. For moderately abrasive fine material ½ in. For lump material more or less abrasive a thicker top cover is necessary to take the wear and to cushion belt against blows. One-eighth inch is common practice, increased to ⅜ in. or ½ in. for abrasive ore and coke.

BACK COVERS

One thirty-second in. is standard. To prevent entrance of moisture due to injury or excessive wear on pulleys, ⅛ in. back cover may prove economical.

STRETCH

Take-up device should allow for 2% elongation of belt in service.

For additional data ask for Goodrich Catalogue Section 2800 "Conveyor and Elevator Belt Practice."

GOODRICH ELEVATOR BELTING

STANDARD QUALITY FOR GENERAL SERVICE:

MORECON GRADE

For handling sand, clay and similar materials of a moderately abrasive character. Built on 32-oz. duck.



HIGH QUALITY FOR SEVERE SERVICE:

AKRON GRADE

For stone, slag and similar abrasive lump materials. Built on 36-oz. duck. Tough cover. Cost averages approximately 20% above Morecon.



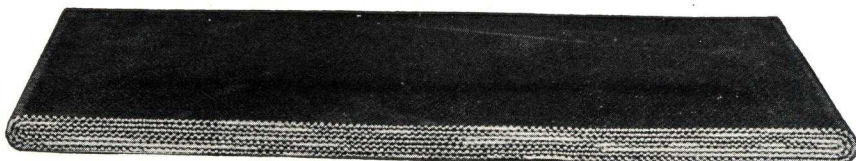


SPECIAL GRADE FOR EXTREME SERVICE: NEW MINING GRADE

For sharp, wet, granular material. Built on 35.5-oz. hard woven duck. Extra coating of highest quality rubber between plies. Cover is Goodrich Armorite, toughest known rubber compound. Fabric carcass is entirely surrounded by cord breaker fabric network, embedded in cover, indicated by red line in cut, which thoroughly ties rubber to the carcass to resist gouging and other abuse. Average cost is approximately 50% higher than Morecon.

SPECIAL GRADE FOR GRAIN ELEVATORS: LEGRAIN GRADE

Quality similar to Akron Elevator but usually supplied without rubber cover. Made in two weights, 32-oz. for terminal elevators and 28-oz. for country elevators. Cost approximately 20% above Morecon.



ELEVATOR BELT DATA

NUMBER OF PLYS

The purpose of fabric in elevator belts is:

- (1) To resist tension.
- (2) To provide sufficient body to hold bucket bolts.

MINIMUM NUMBER OF PLYS

An elevator belt must have enough body to back up the buckets, to hold the bolts and to resist the breaking effect of lumps of material caught between the boot pulley and the belt. Table 4 shows the minimum number of plies permissible for various widths.

TABLE 4—MINIMUM PLYS OF ELEVATOR BELTS

Width of belt, in.	For heavy material	For grain or other light, non-abrasive material
10 to 12	5-ply	4-ply
14 to 18	6-ply	5-ply
20 to 30	7-ply	6-ply
32 and over	8-ply	7-ply

MAXIMUM NUMBER OF PLYS

Because of the stiffening of the belt due to the buckets, however, it is necessary to avoid using too many plies in proportion to pulley diameters. Table 5 shows the maximum number of plies for various diameters of head pulley.

TABLE 5—MAXIMUM PLYS OF ELEVATOR BELTS

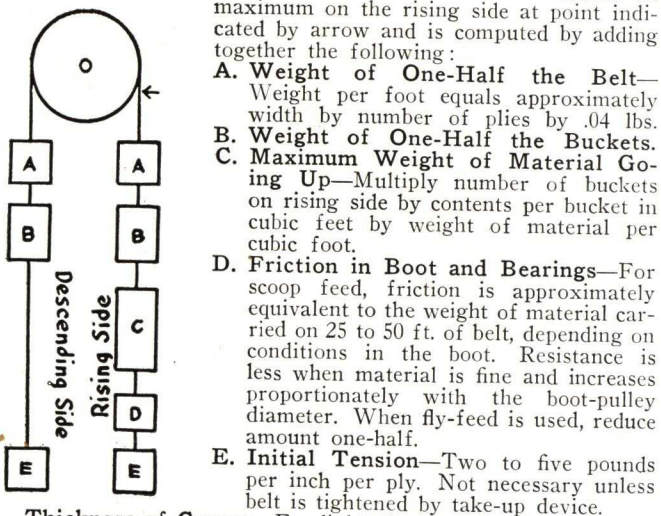
Diameter of head pulley, in.	Number of plies
24	5-ply
30	6-ply
36	7-ply
42	8-ply
48	9-ply
54	10-ply
60	12-ply
72	14-ply

In estimating resistance to tension calculate according to the following:

Grade	Working strength per inch per ply
Morecon	27½ lbs.
Akron	30 lbs.
New Mining	30 lbs.
Legrain 32-oz.	27½ lbs.
Legrain 28-oz.	25 lbs.

TENSION IN ELEVATOR BELTS

The adjoining cut graphically represents the various component parts of the tension in elevator belts. It reaches its maximum on the rising side at point indicated by arrow and is computed by adding together the following:



A. Weight of One-Half the Belt—

Weight per foot equals approximately width by number of plies by .04 lbs.

B. Weight of One-Half the Buckets.

C. Maximum Weight of Material Going Up—Multiply number of buckets on rising side by contents per bucket in cubic feet by weight of material per cubic foot.

D. Friction in Boot and Bearings—For scoop feed, friction is approximately equivalent to the weight of material carried on 25 to 50 ft. of belt, depending on conditions in the boot. Resistance is less when material is fine and increases proportionately with the boot-pulley diameter. When fly-feed is used, reduce amount one-half.

E. Initial Tension—Two to five pounds per inch per ply. Not necessary unless belt is tightened by take-up device.

Thickness of Covers—For light, dry, non-abrasive materials such as grain, elevator belts are made without rubber cover. For moderately abrasive materials, covers may be ⅜ or ⅞ in. For extremely abrasive or abusive service covers should be over ⅞ in. In heavy mining service covers as thick as ¼ in. are employed. It is usually more economical to have a thicker cover on the pulley side.

Width—Good practice calls for a belt 2 in. wider than the buckets.

Length of Belt—Add diameters in inches of head and boot pulleys and multiply by .131. Add to this product twice the distance between centers. The result is the length in feet.

Horsepower—Horsepower is equal to the sum of components C and D in the adjoining diagram, in pounds, multiplied by the speed of the belt and then divided by 33,000.

Capacity—Tons per hour equals average weight in pounds carried per bucket times the number of buckets passing over the head pulley per hour, divided by 2,000.

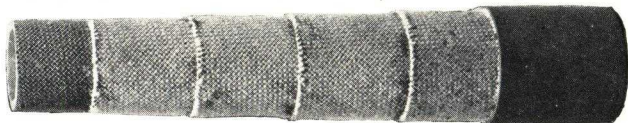
For additional information ask for Goodrich manual of Conveyor and Elevator Belt Practice.

FACTS ABOUT HOSE

DEFINITION OF TERMS

WRAPPED CONSTRUCTION HOSE

Woven cotton duck, impregnated with rubber, is wrapped around the tube in a spiral cross section. Weight of duck



ranges from 5 oz. per square yard to 32 oz. per square yard. Number of wrappings determines number of plies.

BRAIDED CONSTRUCTION HOSE

Instead of woven duck the hose is reinforced by strands of yarn braided over the tube as ribbons are braided on a maypole.



Affords superior flexibility and resistance to kinking.

COMBINATION CONSTRUCTION HOSE

Two or more plies of wrapped duck, outside of which is applied one ply of braided yarn. Combines internal strength



and rigidity of fabric with flexibility of braid. Does not come unwrapped when rubber cover is worn out.

COVER

Outside rubber layer, applied over the cotton reinforcement.

TUBE

The rubber lining—usually formed by extrusion from a "tubing" machine—through a die exactly controlling the I. D. and O. D. At this stage the rubber is like dough.

MANDREL CURE

Hose is wrapped or braided on 50-ft. steel poles or "mandrels" and then cured (or vulcanized) in steam-filled heaters. Mandrel cure insures accuracy in inside diameter, a smooth surface tube, and high burst resistance. Cannot be used for long lengths. Mandrel cured hose is identified by the cloth impression on the surface.

LONG LENGTH CURE

Hose is built in continuous 500-ft. lengths, covered temporarily with a lead casing and then coiled in the curing heaters. Inside of hose is filled with hot water at high pressure. Insures a more compact wall. Identified by its molded surface, usually smooth, sometimes corrugated. Not adapted to sizes over 1½ in. I. D.

COTTON RUBBER-LINED HOSE

Cotton jacket is woven on a circular loom. Sometimes made with two cotton jackets. Rubber lining is inserted. As a

rule there is no rubber cover. Adaptable for fire hose since it affords light weight, compact reeling and high resistance to burst. Maximum length 50 ft. Not suitable for hose exposed to severe external wear or corrosion.

WORKING PRESSURES

Experience has proved that the recommended maximum working pressure of hose should not exceed one-fourth of its ultimate bursting pressure—a safety factor of four to one. Working pressures may momentarily exceed the recommended maximum, but if the excess pressure is continuous the hose structure is strained and rendered more susceptible to injury and deterioration.

TEST PRESSURES

In some cases hose is guaranteed to meet certain initial "Test Pressures." This is usually about one-half the ultimate bursting pressure or twice the recommended working pressure.

FRICTION LOSS IN RUBBER HOSE

Table No. 6 is based on frictional resistance to flow of water in straight lines of hose with open end. A margin should be allowed for short bends.

Couplings—For each set of shank couplings or nipples, increase loss 5%. No allowance need be made for expansion ring or full-flow couplings.

Liquids—The table is calculated for water. Pressures should be increased proportionately for liquids of higher viscosity or higher specific gravity. If necessary to figure on a close margin it is desirable to ascertain the exact inside diameter of the hose since the latter is subject to slight variation from the nominal inside diameter.

Generally speaking, the friction loss in rubber hose is less than in iron pipe.

TABLE NO. 6—LOSS IN POUNDS PRESSURE PER 100 FEET OF HOSE
Actual inside diameter, in.

U. S. gal. per min. water	½	¾	1	1¼	1½	2	2½	3	4	5
1½ ...	2.8	0.7	0.5							
2½ ...	7.6	2.1	1.1							
5 ...	28.5	9.6	4.0	1.1	0.4	0.2				
10 ...	101.0	33.8	14.0	4.1	1.2	0.5	0.2			
15 ...		70.0	30.0	8.9	2.5	1.1	0.4	0.1		
20 ...		112.0	53.0	14.0	4.3	1.8	0.7	0.2		
25 ...			79.0	22.0	6.5	2.9	1.0	0.3		
30 ...			112.0	31.0	9.2	4.0	1.4	0.4	0.1	
35 ...			147.0	41.0	12.0	5.3	1.8	0.5	0.2	
40 ...				53.0	15.0	6.7	2.4	0.6	0.3	
45 ...				66.0	19.0	8.4	3.0	0.8	0.4	
50 ...				80.0	24.0	10.0	3.6	1.0	0.5	
60 ...				101.0	35.0	14.0	5.1	1.4	0.6	
70 ...					45.0	19.0	6.6	1.8	0.8	
80 ...					58.0	24.0	8.6	2.3	1.1	
90 ...					71.0	30.0	11.0	3.0	1.4	0.3
100 ...					88.0	37.0	12.5	3.5	1.7	0.4
125 ...					132.0	55.0	20.0	5.3	2.5	0.6
150 ...					183.0	78.0	27.0	7.5	3.5	0.7
175 ...						100.0	37.0	10.0	4.6	1.1
200 ...						133.0	46.0	13.0	5.9	1.4
250 ...							70.0	19.0	9.1	2.1
300 ...							95.0	27.0	12.0	2.9
350 ...							126.0	36.0	17.0	4.0
400 ...								46.0	21.0	5.1
450 ...								57.0	26.0	6.3
500 ...								70.0	32.0	7.4
1000 ...									116.0	27.0
2000 ...										100.0

EXAMPLE—What water pressure is required at intake end of a 200-ft. line of 1½-in. hose joined in 50-ft. lengths with shank couplings? A delivery of 50 gals. of water per minute is desired. Consulting the table we find the hose requires 10 lbs. per 100 ft. or 20 lbs. for the 200 ft. Adding 5% for each of four sets of couplings, we have a total of 24 lbs.



GOODRICH AIR HOSE

For Couplings see Page 19

HIGH GRADE AIR HOSE FOR GENERAL SERVICE: TYPE 50

Largest selling air hose, available in all local stocks. Red cover, braided construction, long length cure. A hose of high quality, yet light enough to insure easy handling and flexibility. Extremely tough cover, oil-proof tube.

Service Recommendations—

Two-braid weight—shop tools, tie tamping, light portable compressor service, tire inflation ($\frac{1}{4}$ in. and $\frac{3}{8}$ in.).

Three-braid weight, for heavy shop tools, average and heavy portable compressor service, tie

tamping, air hoists, metal mining, average quarry service. Can be supplied in 50-ft. lengths or in continuous lengths up to 500 ft.



Size, in.	No. braids	Working pressure, lbs.	List price per foot, uncoupled
$\frac{1}{4}$	2	250	\$0.225
$\frac{3}{8}$	2	200	.27
$\frac{1}{2}$	2	200	.35
$\frac{3}{4}$	3	250	.40
$\frac{1}{2}$	3	225	.45
$\frac{3}{4}$	2	150	.40
$\frac{1}{2}$	3	200	.49
1	3	150	.54

EXTRA QUALITY HOSE FOR MINING SERVICE: COMMANDER

Grey cover, braided construction, mandrel cured, maximum length 50 ft. An extra heavy hose, stronger than necessary for ordinary pneumatic tool service, but adapted to extreme conditions in mines and quarries, extra heavy shop tools, heavy air hoists, large air-operated machines. The two-braid weight is suitable for general service. Three-braid weight is recommended for hardest conditions.



Size, in.	No. braids	Working pressure, lbs.	List price per foot, uncoupled
$\frac{1}{2}$	2	225	\$0.60
$\frac{3}{4}$	3	275	.68
$\frac{1}{2}$	2	175	.78
$\frac{3}{4}$	3	225	.94
1	3	175	1.16
$1\frac{1}{4}$	3	150	1.44
$1\frac{1}{2}$	3	150	1.94

LIGHT WEIGHT PNEUMATIC TOOL HOSE: AKRON

Black cover, wrapped construction, long length cure. Supplied in continuous lengths up to 500 ft. A compact, strong hose, yet light in weight and easily handled. For light shop tools, air-operated industrial machines, blow guns, air lifts.



Size, in.	No. plies	Working pressure, lbs.	List price per foot, uncoupled
$\frac{3}{8}$	6	125	\$0.24
$\frac{1}{2}$	7	125	.33
$\frac{3}{4}$	7	125	.44

WIRE WINDING

Wire winding is becoming obsolete because of the tough rubber covers on modern air hose. Where desired, however, half round winding can be furnished to order at extra prices as below:

Size of hose, in.	List price per foot	Size of hose, in.	List price per foot
$\frac{3}{8}$	\$0.10	1	\$0.14
$\frac{1}{2}$	.11	$1\frac{1}{4}$	.17
$\frac{5}{8}$	.12	$1\frac{1}{2}$	.20
$\frac{3}{4}$	.13	2	.25

HEAVY DUTY WRAPPED HOSE FOR MINING SERVICE: TYPE 88

Grey cover, wrapped construction, mandrel cured. An extra heavy hose with thick tough cover. Recommended for same service as Commander. It meets the requirements of operators who prefer a wrapped construction hose. Maximum length—50 ft.



Size, in.	No. of plies	Working pressure, lbs.	List price per foot, uncoupled
$\frac{1}{2}$	4	225	\$0.48
$\frac{3}{4}$	4	200	.67
1	5	175	.87
$1\frac{1}{4}$	5	150	1.26
$1\frac{1}{2}$	6	150	1.76
2	6	150	2.24

CLOTH INSERTED HOSE

Made like wrapped hose in small diameters with an insertion of cotton sheeting to impart strength to resist pressures.

The $\frac{1}{4}$ and $\frac{1}{8}$ -in. sizes are made with red cover, designated as Type 22. Especially adapted to air lines on paint spraying outfits.



Size, in.	No. plies	O.D., in.	Color	Grade	Maximum length, ft.	List price per 100 feet
$\frac{3}{16}$	3	$\frac{7}{16}$	Black	Heavy C.I. hose	12	\$11.85
$\frac{1}{8}$	5	$\frac{1}{8}$	Black	Standard C.I. hose	12	12.70
$\frac{1}{4}$	3	$\frac{1}{2}$	Red	Type 22	50	18.70
$\frac{1}{8}$	3	$\frac{3}{8}$	Red	Type 22	50	19.20

BRAIDED COVER HOSE

Black rubber tubing covered with a layer of black and yellow cotton braids. Furnished in reels 500 ft. long. Used for air or liquids under pressure. Will not stand abrasive wear.

Size, in.	O.D., in.	Working pressure, lbs.	List price per 100 feet
$\frac{1}{8}$	$\frac{1}{8}$	200	\$ 6.80
$\frac{1}{4}$	$\frac{1}{4}$	175	8.60
$\frac{1}{2}$	$\frac{1}{2}$	150	10.30
$\frac{3}{4}$	$\frac{3}{4}$	125	12.50
$\frac{1}{2}$	$\frac{1}{2}$	100	



GOODRICH WATER HOSE

For Couplings see Page 19

STANDARD QUALITY FOR GENERAL SERVICE: JUPITER

Braided construction, long length cure. Meets 75% of water hose requirements in industrial plants and yards for wash-up service. 1-in., 1¼-in. and 1½-in. sizes are made in both two-braid and three-braid weights, the two-braid being heavy enough for moderate service.



Size, in.	No. of braids	Working pressure, lbs.	Max. length, ft.	List price per ft., uncoupled
¾	3	150	500	\$0.40
1	2	125	500	.40
1	3	150	500	.50
1¼	2	100	250	.50
1¼	3	125	250	.62
1½	2	100	250	.60
1½	3	125	250	.75
*2	3	125	50	1.00

*(Mandrel cured).

HIGH PRESSURE HOSE FOR SEVERE SERVICE: HIGH DUTY

Braided construction. Smaller sizes long length cure; 1½-in. and 2-in. sizes mandrel cured. Cords are extra heavy, affording resistance to high pressure. Cover is of thick, black, extremely tough, wear-resisting compound. Because of its strong construction High Duty is not so flexible as Jupiter, but adapted to severe service under high pressures. Cost averages approximately 25 to 35% above Jupiter.



Size, in.	No. of braids	Working pressure, lbs.	Max. length, ft.	List price per ft., uncoupled
¾	2	200	500	\$0.30
1	2	200	500	.40
1¼	3	200	250	.62
1½	3	200	50	.75
2	3	200	50	1.00

For sizes over 2½ in. see Commander Fire Hose, page 14.

COMBINATION CONSTRUCTION FOR SEVERE SERVICE: BROWN COMBINATION

Combination construction mandrel cured, 50-ft. lengths. Older type hose than High Duty with a very successful record for service involving high pressure or severe wear. Used in paper mills, mines, greenhouses and in the larger sizes for concrete paving machines. Cost averages approximately 30% above High Duty.



Size, in.	No. of plies	Working pressure, lbs.	List price per ft., uncoupled
1½	3	200	\$0.25
¾	3	200	.30
1	3	150	.40
1	4	200	.50
1¼	3	125	.50
1¼	4	175	.62
1½	4	175	.75
1½	5	200	.93
2	4	150	1.00
2	5	200	1.25
2½	5	200	1.56

WRAPPED WATER HOSE

Wrapped construction being an older type of hose is still preferred by many users. Goodrich stocks two grades. Maximum length, 50 ft.

CASCADE

High quality tough red cover.



Size, in.	No. of plies	Working pressure, lbs.	List price per ft.
1	4	125	\$0.50
1¼	4	125	.62
1½	4	100	.75

DELUGE

Black cover, dependable quality. Cost averages approximately 40% below Cascade.



Size, in.	No. of plies	Working pressure, lbs.	List price per ft.
1	3	100	\$0.40
1	4	125	.50
1¼	4	125	.62
1½	4	100	.75
2	4	75	1.00
2	5	100	1.25

GARDEN HOSE

MAXECON

Braided construction, long length cure, black corrugated cover. Maximum length 500 ft. High quality lawn hose. Also economical for average contractors and industrial service.



Size, in.	No. of braids	Working pressure, lbs.	List price 50 ft., coupled	Per ft., uncoupled
½	2	125	\$10.50	\$0.21
¾	2	125	11.00	.22
¾	2	125	12.00	.24

SUPER QUALITY: DE LUXE

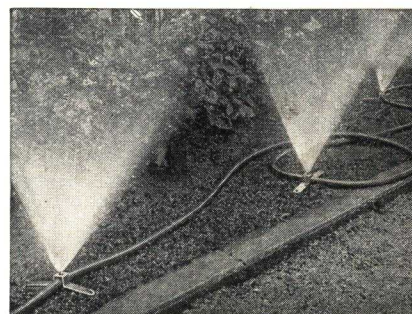
Braided construction, long length cure, maximum length 500 ft. Extra heavy couplings. Green ribbed cover. For contractors, greenhouses, golf courses, large estates and other severe service.

Size, in.	Working pressure, lbs.	List prices	
		50-ft. lengths, coupled	Per ft., uncoupled
¾	150	\$13.50	\$0.26
¾	150	15.00	.29
1	150	20.00	.38

HOSE WITH BUILT-IN SPRAYS

Multispray Outfits—Consist of 50 ft. Maxecon hose, coupled, ¾ in. size, with four built-in spray heads, detachable supports and end cap. Packed in a box. Ideal method of spraying large area quickly. Four sprays use no more water than one spray nozzle.

List price per outfit, \$15.00.





MILL FIRE PROTECTION HOSE

50-ft. lengths

For Couplings see page 19

GOODRICH FLAT CURE

All Goodrich Cotton Rubber Lined Mill Fire Hose 1½ in. and larger is made flat, as shown below. Flat cure hose becomes round like ordinary hose when filled with water under 5 lb. pressure, and carries the same amount of water.

It coils more compactly and lasts years longer, because when coiled the rubber is in its natural position and not under tension.

GOODRICH HYDROSEAL TREATMENT

Mainstay and Summit grades can be furnished with the new Goodrich Hydroseal treatment, by which every cotton strand in both single and double jacket hose is completely impregnated with the wax and gum mixture. This affords high resistance to water absorption, prevents hose from freezing tight to the ground, and gives maximum protection against mildew, although it does not prevent the necessity of drying the hose after using.

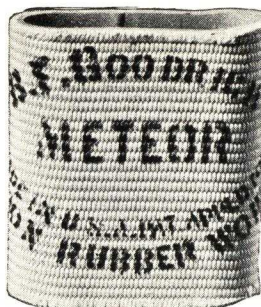
HIGHEST QUALITY SINGLE JACKET: MAINSTAY



DeLuxe grade for long life and greatest ultimate economy. Guaranteed for 300 lbs. test pressure on delivery. Made in 1¼, 1½, 2, 2½, 3 and 4-in. sizes.

MEDIUM QUALITY SINGLE JACKET: METEOR

Cost approximately 20% below Mainstay. Guaranteed for 250 lbs. test pressure on delivery. Made in 1, 1¼, 1½, 2 and 2½-in. sizes.



STANDARD LIST PRICES COTTON, RUBBER LINED HOSE, SINGLE JACKET, UNCOUPLED

Size, in.	Per foot
1	\$0.40
1¼	.45
1½	.50
2	.65
2½	.80

RUBBER COVERED FOR SEVERE ABRASION AND CORROSIVE FUMES:

WHITE ANCHOR

Wrapped type hose with white rubber cover which protects hose from wear and acid fumes. Especially recommended for oil refineries and chemical plants. Guaranteed to meet initial test pressure of 350 lbs. Sold at net prices, including heavy type couplings. Cost is approximately 60% more than Mainstay.



RUBBER COVERED FOR ABRASION AND CORROSIVE FUMES:

COMMANDER

Commander hose is made like Mainstay cotton rubber lined hose except that a tough rubber cover is vulcanized on the outside to protect the cotton. Guaranteed for initial test pressure of 300 lbs. Cost is approximately 45% higher than Mainstay. For fire protection where exposed to excessive moisture, abrasion or corrosive fumes. Also for general water discharge service when a large diameter hose is wanted.

Size, in.	Per foot, uncoupled
1½	\$1.20
2	1.48
2½	1.68
3	2.02
4	2.68

LIGHT WEIGHT SINGLE JACKET: SOLAR



An inexpensive but dependable brand. Guaranteed to meet initial test pressure of 200 lbs. Cost is approximately 30% less than Mainstay. Made in 1, 1¼, 1½, 2 and 2½-in. sizes.

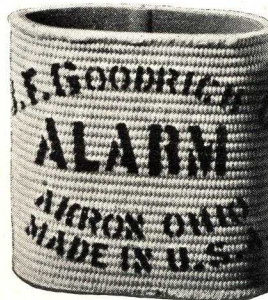
UNDERWRITERS' SINGLE JACKET: SIGNAL

Meets specification tests of Chicago Underwriters' Laboratory, with Underwriters' label. Cost is approximately 10% more than Mainstay. Made in 1½, 2 and 2½-in. sizes.



UNDERWRITERS' SINGLE JACKET: ALARM

To specifications of Associated Factory Mutual Laboratory. Cost approximately 10% more than Mainstay. Made in 2½-in. size.



DOUBLE JACKET: SUMMIT

For plants maintaining large fire departments where hose is frequently used. The extra jacket affords additional resistance to wear and is adaptable to use on ladders since the twist is much lower than in single jacket hose. Guaranteed to meet initial test pressure of 350 lbs. Cost with heavy municipal type couplings is approximately 15% higher than Mainstay. List prices, uncoupled:

1½ in.	\$0.68 per foot
2 in.	.85 per foot
2½ in.	.98 per foot





GOODRICH STEAM HOSE

For Couplings see page 19

In the tables below, "Low" refers to temperatures corresponding to saturated steam below 50 or 60 lb. per square inch pressure, "Medium" refers to from

50 to 80 lb. and "High" to pressures over 80 lb. Maximum length of all constructions, 50 ft. However, 25 or 12½-ft. lengths may be furnished from stock.

HIGH QUALITY FOR SEVERE SERVICE:

GOODRICH BRAND

Wrapped construction, mandrel cured. Maximum length 50 ft. For pile drivers, coal thawing, oil refineries, contractors and general service.

This is the most widely stocked grade of steam hose in the Goodrich line and the highest quality of cotton fabric reinforced steam hose it is possible to obtain. Effective for superheated as well as saturated steam.



Sizes, in.	No. of plies	Temperatures	List prices per foot, uncoupled
1½	4	Low and Med.	\$0.56
1½	5	High	.70
1½	6	High	.84
1½	4	Low	.71
1½	5	Medium	.87
1½	6	High	1.05
1½	8	High	1.41
1	4	Low	.87
1	5	Medium	1.07
1	6	High	1.28
1	8	High	1.70
1¼	5	Low and Med.	1.30
1¼	6	High	1.56
1½	5	Low and Med.	1.56
1½	6	High	1.87
1½	8	High	2.50
2	6	Low and Med.	2.49
2	8	High	3.32

FOR SEVERE EXTERNAL WEAR:

TYPE 55 STEAM AND WASHOUT

Combination construction, mandrel cured, maximum length 50 ft. A good general utility hose not only for steam and hot water but car washing service, spray hose, and a clean-up hose in creameries, packing houses and other similar types of service. The outer ply is a layer of herringbone braid. This serves to hold the cover in place where the hose is subjected to severe wear.

Cost is approximately 10% below Goodrich.



Sizes, in.	No. of plies	Temperatures	List prices per foot
1½	4	Medium	\$0.56
1½	4	Medium	.71
1½	4	Low	.87
1	5	Medium	1.07
1¼	5	Medium	1.30
1½	5	Low	1.56
1½	6	Medium	1.87
2	5	Low	2.07
2	6	Medium	2.49

FOR LOW PRESSURES:

FALCON

Wrapped construction, mandrel cured, maximum length 50 ft. Durable hose for low pressure steam and hot water service. Cost is approximately 20% lower than Goodrich.



Sizes, in.	No. of plies	Temperatures	List prices per foot
1½	4	*	\$0.56
1½	5	Low	.70
1½	4	*	.71
1½	5	Low	.87
1	4	*	.87
1¼	5	Low	1.07
1¼	5	*	1.30
1¼	6	Low	1.56
1½	5	*	1.56
1½	6	Low	1.87
2	6	*	2.49
2	8	Low	3.32

*Hot water.

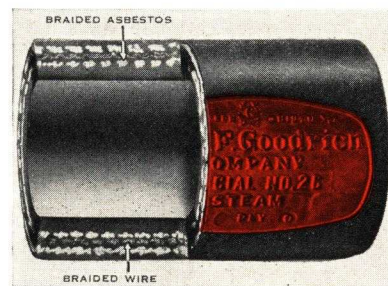
WIRE WINDING

Half-round wire winding with ⅝ in. spacing sometimes increases steam hose life. For prices see page 12.

SPECIAL QUALITY FOR HIGH PRESSURE:

TYPE 26

Asbestos and wire insertion. Braided construction, mandrel cured. A new type of steam hose containing no cotton, the braid consisting of asbestos and wire. For extreme service. Recommended for steam pressures up to 200 lb.



Sizes, in.	List price per foot, uncoupled
1½	\$1.14
1	1.58
1	2.42
1¼	3.04
1½	3.40

ORCHARD SPRAY HOSE

Goodrich Orchard Spray Hose is built for working pressures up to 500 lbs., and with oil resisting tube that withstands all spraying solutions and emulsions.

FOR HIGH PRESSURE SPRAYING: HIGH DUTY

Strong braided plies. Tough durable cover.

The ideal hose for high pressure spraying.



FOR GENERAL SERVICE: TYPE 88

Long length wrapped fabric construction, with high bursting strength. An exceptionally strong and compact hose.

HIGH DUTY			TYPE 88		
Sizes, in.	No. of braids	List prices per 100 ft., uncoupled	Sizes, in.	No. of plies	List prices per 100 ft., uncoupled
¾	3	\$27.30	¾	5	\$27.30
1½	3	33.40	1½	6	30.00
1½	3	40.00	1½	7	32.70
			1½	7	41.00



GOODRICH SUCTION HOSE

HIGH GRADE FOR WATER: TYPE 44

Reinforced with extra heavy flat wire inside the tube. This construction is commonly known as "Rough Bore." Superior in resistance to crushing. For pumping out excavations and other general service. Orders must specify whether hose is to be furnished with straight ends for couplings or enlarged ends for nipples. Maximum length 50 ft. Commonly used in 10, 15 and 20-ft. lengths.



I.D., in.	List price per foot, uncoupled
2	\$1.80
2½	2.14
3	2.50
4	2.82

INEXPENSIVE GRADE FOR WATER: TYPE 33

For contractors and similar service. "Rough Bore" construction. Made in same lengths as Type 44. Superior resistance to crushing. Orders must specify whether hose is to be furnished with straight ends for couplings or enlarged ends for nipples.

I.D., in.	List price per foot, uncoupled
2	\$1.42
2½	1.82
3	2.08
4	2.62

HEAVY DUTY FOR VACUUM CLEANING: GOODRICH

For air suction only. Heavy round wire insertion, rubber covered.



I.D., in.	List price per foot, uncoupled
¾	\$1.14
1	1.25
1¼	1.34
1½	1.46
1¾	1.71
2	1.94
2½	2.32

FOR GRITTY OR CORROSIVE MATERIALS:

CASCADE

This construction is described as "Smooth Bore" since it is reinforced with round wire built into the wall, so that the materials contact only with rubber, insuring longer wear under abrasion or corrosive conditions. Cascade is a high grade, sturdy hose for general service. Maximum length 50 ft. Usually furnished in 10, 15 and 20-ft. lengths. Orders must specify whether hose is to be furnished with straight ends for couplings or enlarged ends for nipples.



I.D., in.	List price per foot, uncoupled
2	\$1.79
2½	2.44
3	3.28
4	4.52
5	6.10
6	7.32

HARD RUBBER SUCTION HOSE FOR LIGHT SERVICE: SUMMIT

Contains no wire, but rubber is cured to a sufficient firmness to resist low vacuums. Made only with straight ends for couplings. Wrapped construction, mandrel cured, maximum length 50 ft.



I.D., in.	List price per foot, uncoupled
¾	\$0.41
1	.50
1¼	.575
1½	.68
2	.89

ACID SUCTION HOSE

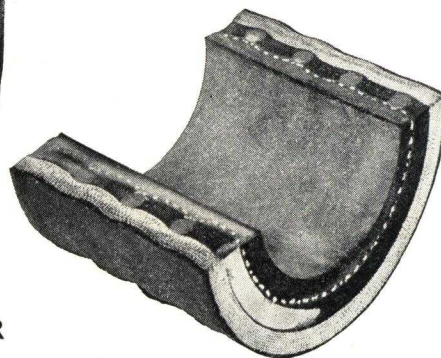
Same quality material as Goodrich Acid Hose (page 17) except for insertion of round coppered steel wire. Suitable for service up to full vacuum. Tube is ⅜ in. thick, anchored to carcass of hose by cord breaker fabric.

Size, in.	List price per foot
1½	\$2.26
2	3.08
2½	3.54
3	4.20

HEAVY DUTY FOR ABRASIVE CONDITIONS:

AKRON

Extra heavy, smooth bore hose for flexible connections on suction dredges and similar severe service in large diameters. Number of plies for each size is less than in other manufacturers' hose because of the heavy fabric used. Extra heavy construction contains an additional wire reinforcement. Made to order in any length 3 ft. to 50 ft., with enlarged ends for nipples.



Details of Construction of Akron Hose

- (1) Tube of Goodrich Armortite, toughest known rubber compound.
- (2) Cord network insuring adhesion of tube under highest vacuum.
- (3) Heavy spring steel wire.
- (4) Extra heavy cotton duck reinforced with additional wire in "extra heavy" construction.
- (5) Thick, tough rubber cover.

I.D., in.	List price per foot, uncoupled	
	Standard construction, ¼-in. tube	Extra heavy construction, ½-in. tube
4	\$12.36	
6	19.38	
8	26.64	
10	32.60	
12	40.70	\$42.20
14	45.80	52.40
16	56.40	58.44
	75.70	70.20

MOLASSES SUCTION HOSE: TYPE 100

Extra heavy rough bore hose for either suction or discharge of molasses or other heavy liquids.

Size, in.	List price per foot
4	\$ 9.56
6	14.46
8	17.78

AGRICULTURAL SUCTION HOSE

Lighter than Type 33. Rubber covered, rough bore.

Size, in.	List price per foot
1½	\$0.89
2	1.00



FOR OXY-ACETYLENE WELDING: GOODRICH

Braided construction, long length cure, furnished in any length up to 500 ft. Corrugated cover. Red cover hose is used for acetylene line and green cover hose is used for oxygen line.



I.D., in.	List price per foot, uncoupled
$\frac{3}{16}$ 1 br.	\$0.24
$\frac{1}{4}$ 2 br.	.33
$\frac{1}{4}$ 3 br.	.40
$\frac{1}{2}$ 2 br.	.37
$\frac{3}{8}$ 2 br.	.40
$\frac{3}{8}$ 3 br.	.47

HEAT RESISTING WELDING HOSE: FIRE KING

For oxy-acetylene welding, also suitable for air or water. Rubber specially compounded for heat resistance. Outer ply of braided asbestos cord. Economical for use where molten metal or flame is liable to damage hose. Red or green colors. Maximum length 50 ft.



Size, in.	O.D., in.	List price per foot, uncoupled
$\frac{1}{4}$	$\frac{11}{16}$	\$0.43
$\frac{3}{8}$	$\frac{3}{4}$	.465
$\frac{1}{2}$	$\frac{7}{8}$	.50

FOR SAND BLAST: GOODRICH

Wrapped construction, mandrel cured. Maximum length 50 ft. Tube is $\frac{1}{4}$ in. thick of floating rubber stock. Construction resists collection of static. All sizes are 4-ply.



I.D., in.	List price per foot, uncoupled
$\frac{3}{4}$	\$1.11
1	1.22
1 $\frac{1}{4}$	1.43
1 $\frac{1}{2}$	1.64
2	2.04
2 $\frac{1}{2}$	2.50
3	3.10

FOR ACIDS: GOODRICH

Wrapped construction, mandrel cured. Maximum length 50 ft. For discharge lines handling acids and other corrosives. Tube is $\frac{3}{16}$ in. thick. All sizes

are 4-ply. See page 16 for Acid Suction Hose.



I.D., in.	List price per foot, uncoupled
$\frac{1}{2}$	\$0.67
$\frac{3}{4}$	.80
1	.96
1 $\frac{1}{4}$	1.20
1 $\frac{1}{2}$	1.36
2	1.78
2 $\frac{1}{2}$	2.18
3	2.70

FOR PAINT SPRAY: MAINSTAY

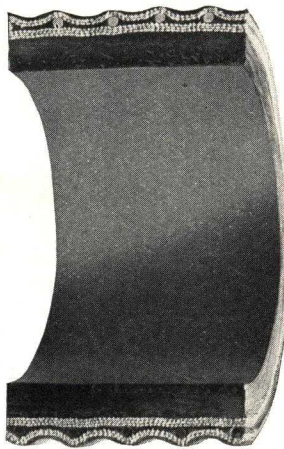
Braided construction, long length cure. Maximum length 500 ft. Tube and cover of special compound with effective resistance to turpentine and other paint solvents.



I.D., in.	List price per foot, uncoupled
$\frac{1}{4}$ 1 br.	\$0.14 $\frac{1}{2}$
$\frac{3}{8}$ 2 br.	.21 $\frac{1}{2}$
$\frac{1}{2}$ 2 br.	.26 $\frac{1}{2}$

FOR SAND AND CEMENT DISCHARGE

Wrapped construction, mandrel cured. Tube is Goodrich Armortite, the toughest known rubber, $\frac{1}{4}$ in. thick in sizes up to 4 in., and $\frac{1}{2}$ in. thick in larger sizes. An insertion of wire imparts strength equivalent to many plies of fabric. Enlarged ends will be furnished unless otherwise specified.



I.D., in.	List price per foot, uncoupled
2 $\frac{1}{2}$	\$ 5.64
3	6.32
4	7.76
5	13.36
6	15.72
8	21.60
10	29.78
12	39.30

FOR CEMENT GROUTING

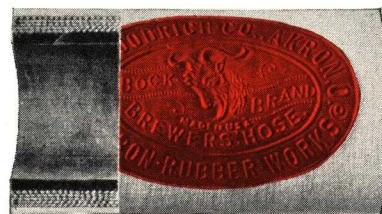
Wrapped construction, mandrel cured, maximum length 50 ft. Similar in construction to sand and cement discharge hose except it is reinforced with two additional plies, without wire insertion. Designed for

high pressures. Enlarged ends will be furnished unless otherwise specified.

I.D., in.	List price per foot, uncoupled
2 6 ply	\$5.88

FOR BEVERAGES: BOCK BREWERS' HOSE

Wrapped construction, mandrel cured, maximum length 50 ft. A super-quality hose for liquids hot or cold, where a high standard of sanitation is required. Well known to the brewery trade in former years. Will not impart odor, taste nor poisonous taint. Cream white cover. Cost is approximately 10% more than Goodrich brand Steam Hose.



TYPE 77

For vinegar, cider or fruit juices. Similar in construction and quality to Bock Brewers' Hose.

BOCK BREWERS' AND TYPE 77 HOSE

I.D., in.	Working pressure, lbs.	List price per foot, uncoupled
$\frac{3}{4}$ 4 ply	175	\$0.71
1 4 ply	150	.87
1 5 ply	175	1.07
1 $\frac{1}{4}$ 4 ply	125	1.04
1 $\frac{1}{4}$ 5 ply	150	1.30
1 $\frac{1}{2}$ 4 ply	125	1.25
1 $\frac{1}{2}$ 5 ply	150	1.56
2 4 ply	100	1.66
2 5 ply	125	2.07

TYPE 23

White, non-toxic inner tube. Tough red cover, insuring flexibility and durability. 50-ft. lengths. Especially for dispensing beverages.

I.D., in.	O.D., in.	Working pressure, lbs.	List price per 50-ft. length, uncoupled
$\frac{5}{16}$ 3 ply	$\frac{7}{8}$	150	\$10.50
$\frac{3}{8}$ 3 ply	$\frac{7}{8}$	150	11.50
$\frac{1}{2}$ 3 ply	$\frac{7}{8}$	150	13.50
$\frac{1}{2}$ 5 ply	$\frac{7}{8}$	250	15.50

FOR CREAMERIES: COMMANDER

Combination construction, mandrel cured, maximum length 50 ft. Tough, cream white cover developed to resist wear and action of animal fats. For wash-up service, conducting steam and hot water. 35 and 50-ft. lengths can be furnished when desired, with built-on soft rubber nozzles.



I.D., in.	List price per foot, uncoupled	List price rubber nozzles
$\frac{3}{4}$	\$0.655	\$3.70
1	.795	3.92



OIL AND GASOLINE HOSE

FILLING STATION HOSE: GOODRICH

Metal lined gasoline hose, woven cotton jacket, Celinol rubber lining with heavy non-crushing interlocking metal tube. Meets Underwriters' tests. Maximum length 60 ft.



Size, in.	List prices	
	*10-ft. lengths, coupled	Each additional foot
3/4	\$5.44	\$0.384
1	6.42	.444
1 1/4	8.14	.544

*Price includes protector rings.

GASOLINE TANK TRUCK HOSE

Construction similar to filling station hose, except for the addition of special wire filler in the jacket, which greatly increases flexibility and strength.

Size, in.	List prices	
	10-ft. lengths, coupled	Each additional foot
1 1/2	\$12.48	\$0.816
2	16.80	1.09

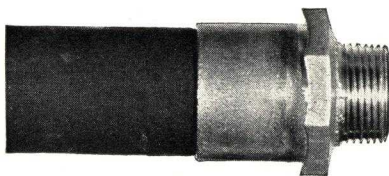
GASOLINE TANK CAR UNLOADING HOSE

Same construction as tank truck hose, except heavier.

Size, in.	List prices	
	10-ft. lengths, coupled	Each additional foot
2 1/2	\$32.10	\$1.85
3	39.88	2.22

RUBBER COVERED PUMP HOSE

The same high quality metal lining and Celinol tube as in our Cotton Covered Gasoline Hose, over which is a ply of strong cords and a specially developed tough black rubber cover, that will not rub off black. This hose remains flexible in wet, cold weather. The specially designed Permalock couplings are guaranteed leak proof. Ideal for airports.



Size, in.	List prices	
	10-ft. lengths, coupled	Each additional foot
3/4	\$5.92	\$0.47
1	6.92	.545
1 1/4	8.86	.67

OIL CARGO HOSE

Goodrich makes various types of heavy duty hose for suction and discharge service on marine docks—also for submarine service. This type of hose is also useful for unloading fuel oil from railroad tank cars into storage tanks.



HOSE FOR FUEL OIL:

GOODRICH DISTILLATE AND FUEL OIL HOSE

Braided construction. Long length cure. For fuel oil tank trucks and similar service. All sizes are three-braid construction.



Size, in.	Maximum length, ft.	List price per foot, uncoupled
1	500	\$0.76
1 1/4	250	.845
1 1/2	250	1.00
2	50	1.56

OTHER TYPES OF HOSE

Goodrich also makes the following types of hose not listed in this catalog:

Air Brake	Cement Gun
Car Heating	Hydraulic Brake
Chemical Extin-	Municipal Fire
guisher	Radiator
Coke	Grease
Drillers'	Steam Ironing
Engine Cleaning	Tanners'
	Tender

All types of hose to A.R.A. specifications.

NOZZLES

RUBBER NOZZLES

Tapered rubber nozzles built on the hose. Useful on water, steam, creamery and other types of hose where there is danger of breakage of fragile equipment from metal nozzles. Can be applied only on mandrel cured hose, not on long length cure.



Size of hose, in.	Length of nozzle, in.	List price, each
1/2	12	\$3.60
3/4	12	3.70
1	12	3.92
1 1/4	12	4.32
1 1/2	18	5.32
2	18	6.24
2 1/2	18	7.62
3	18	9.82

BRASS NOZZLES

Furnished in either screw tip or plain. Iron pipe or standard hose thread. For special thread add 10% to prices.

Garden hose nozzles, adjustable spray—brass, list price \$0.90 each.

Thread size, in.	Length, in.	Screw tip		Plain tip	
		Discharge opening, in.	List price	Discharge opening, in.	List price
3/4	6	1/4	\$0.60	1/4	\$0.60
1	8	1/4	.90	1/4	.84
1 1/4	12	3/8	1.75	3/8	1.60
1 1/2	12	1/2	2.10	1/2	2.00
2	12	5/8	3.30	1	3.00
2 1/2	20	1	8.40	1	7.90
2 1/2	24	1	8.75	...	...
2 1/2	30	1	12.50	...	...

UNDERWRITERS' PLAY PIPES

Nozzles conforming to specifications of Underwriters' Laboratories and Factory Mutual Laboratory, size 2 1/2 x 30 in. List price each, \$14.66.



HOSE FITTINGS

COMMON COUPLINGS

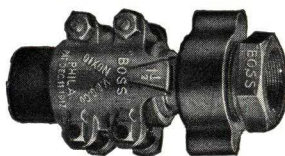
Short shank brass couplings for water pressures up to 50 lbs., also suction service. Size 1 in. and under have gripping flutes on female swivel, but no lugs. Heavy brass ferrule applied outside of hose. Sizes over 1 in. up to 2½ in. inclusive have lugs on female swivel only. Applied with one clamp at each end. Sizes 3 in. and over have lugs on both male and female swivel. Applied with one clamp at each end. Iron pipe thread. For special thread add 10% to price.



Size, in.	List price per set applied
½	\$ 0.55
¾	.55
1	1.00
1¼	1.56
1½	1.78
2	3.24
2½	4.62
3	7.70
3½	13.44
4	15.90
5	24.20
6	43.80

HIGH PRESSURE COUPLINGS

The only 100% safe coupling for water pressures over 100 lbs., and for air and steam above 50 lbs. pressure. Clamps are anchored to shank so that it is almost impossible to blow them off.



Size, in.	List price per end, female	List price per end, male
¼	\$ 1.08	\$ 0.62
¾	1.32	.78
½	1.68	.96
¾	2.88	1.44
1	3.18	1.74
1¼	5.28	2.76
1½	5.52	3.36
2	8.70	4.92
2½	16.80	9.60
3	21.00	13.20
4	39.60	22.50

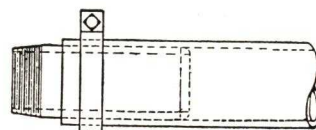
HEAVY FIRE HOSE COUPLINGS

Brass expansion ring type for double jacket hose, White Anchor or Commander rubber covered hose.

Type	Size, in.	List price per set attached
50	1½	\$3.66
50	2	4.44
30	2½	6.66

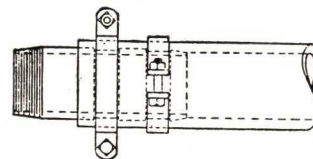
NIPPLES

For suction and other large diameter hose. Made from standard iron pipe. For use with flanges in clamping hose to pipe. Inside diameter of hose must be approximately same as outside diameter of standard pipe or else hose must have enlarged ends.



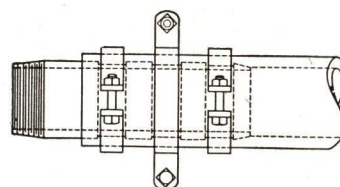
Single-clamp Nipple

Plain pipe without grooves. Iron pipe thread. For light suction or low discharge pressure. Can be attached with wire-winding instead of clamp, when specified.



Two-clamp Nipple

Nipples with two grooves. Iron pipe thread. For general suction service or discharge pressures up to 100 lbs. in sizes up to 2 in., and 50 lbs. in sizes over 2 in.



Three-clamp Nipple

Three grooves. For heavy suction hose service in sizes 4 in. and over, particularly for sand suction and discharge service.

LONG SHANK COUPLINGS

For air and steam pressures up to 50 lbs., water pressures up to 100 lbs. Attached to hose with two clamps at each end. Hexagonal nuts on both male and female swivel. Iron pipe thread. For special thread add 10% to price.



Size, in.	List price per set applied
¼	\$ 1.40
¾	1.40
½	1.56
¾	1.90
1	2.36
1¼	3.00
1½	3.62
2	4.64
2½	8.34
3	13.50
3½	19.74
4	26.00

MILL FIRE HOSE COUPLINGS: TYPE 40

Single jacket mill hose. Brass expansion ring type. Regular commercial mill hose coupling.



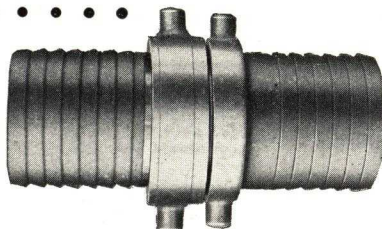
List Prices Per Set Attached

Size, in.	Type 40
1	\$2.00
1¼	2.12
1½	2.22
2	3.34
2½	4.44

SPECIAL SUCTION HOSE COUPLINGS

Similar to common couplings except that male swivels on both shanks are malleable iron instead of brass. Attached with one clamp at each end. Iron pipe thread only.

3-in. lug on swivel only	List prices \$ 5.76 per set
3-in. lugs on both swivel and male part	6.52 per set
4-in. lugs on both swivel and male part	10.00 per set

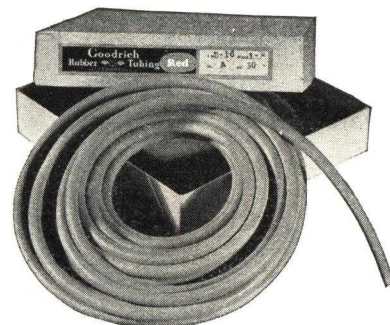


Size, in.	Single-clamp type	Two-clamp type	Three-clamp type
½	\$0.80	\$ 1.00	
¾	.89	1.10	
1	1.12	1.30	
1¼	1.22	1.60	
1½	1.34	2.00	
2	1.60	2.66	
2½	2.12	3.34	
3	3.00	4.44	
3½	3.72	5.56	
4	4.44	7.20	\$16.70
4½			17.60
5		11.12	19.04
6		15.00	20.00
7			22.90
8		20.34	24.46
10			36.68
12			54.46



ALL-RUBBER HOSE

All-rubber hose has no fabric insertion. Suitable only for negligible pressures. Heavy wall sizes may be used for light vacuum service. All grades have good aging qualities and will last indefinitely without appreciable loss of quality if kept covered and in normal temperatures. All grades are free from any poisonous ingredients and will not impart any taste or color to liquids.



Inside diam., in.	Wall thickness, in.	List price per 100 ft.	Stock sizes				List price, Grade A, Black only
			Grade A White	Grade B White	Grade A Red	Grade B Red	
1/16	3/32	\$2.15	*				.....
3/32	3/32	2.26	*				.....
1/8	3/16	2.56	*				.....
1/8	1/8	2.37	*	*	*		.....
1/8	3/16	.....					\$10.20
3/16	3/16	3.11			*		.....
3/16	1/8	3.71		*	*	*	10.70
3/16	3/16	5.68	*		*		13.70
3/16	1/8	8.10	*	*	*	*	14.80
1/4	1/8	4.45	*	*	*	*	11.75
1/4	3/16	6.80	*		*		14.20
1/4	1/8	9.55	*	*	*	*	15.65
1/4	3/16	.....	*	*	*	*	18.55
1/4	1/8	5.12	*	*	*	*	12.60
1/4	3/16	7.95	*	*	*	*	.....
5/16	1/8	.....	*	*	*	*	20.75
5/16	3/16	5.86	*	*	*	*	.....
5/16	1/8	7.40	*	*	*	*	.....
5/16	3/16	9.07	*	*	*	*	14.65
5/16	1/8	12.60	*	*	*	*	16.55
1/2	3/16	11.22	*	*	*	*	16.10
1/2	1/8	15.60	*	*	*	*	18.35
1/2	3/16	18.65	*	*	*	*	20.50
3/4	1/8	21.65	*	*	*	*	22.35

Grade A White—High grade soft, smooth surface. A general purpose hose for gases and liquids.

Grade B White—Slightly firmer than Grade A. Smooth surface. Used for handling beverages, also for cushioning metal rods on toys, etc. Cost is approximately 25% less than for Grade A White.

Grade A Red—High grade soft red "antimony" stock. Smooth surface. Useful in laboratories, and for conveying gases and liquids. Cost is the same as for Grade A White.

Grade B Red—Firmer than Grade A Red. Smooth surface. Finish free from soapstone. Useful for beverages, and as gas hose. Cost is approximately 25% less than Grade A White.

Grade A Black—Pure plantation rubber, floating stock. Black in color, but blooms light gray. Cured on mandrels in 12-ft. lengths. Cloth impression surface. Recommended for laboratory use. Cost is approximately 85% more than for Grade A White.

Grade 433 Black—Medium quality, smooth surface. A general purpose hose suitable for electrical insulation. Cost is approximately 10% less than Grade A White.

Grade 710 Black—Firmer and less elastic than Grade 433. Also costs less. A general purpose hose. Cost is approximately 40% less than Grade A White.

Boxing—All grades packed 50 ft. to the box, except Grade A Black, which is packed with 4 12-ft. lengths per box.

HARD RUBBER SHEET, ROD AND TUBING

SHEETS

Hard rubber sheets are 20x48 in., edges rough, surfaces polished. Any thickness 1/8 to 4 in. Prices per pound on application.

ROD AND TUBING

Furnished any diameter 1/8 to 3 in. Standard length, 30 in. Can be supplied with rough finish, ground finish or polished finish. Prices per pound quoted on application.

GRADES

Made in two black grades, Goodrich and Defiance, the properties of which are as follows:

RESISTANCE TO CHEMICALS

Both Goodrich and Defiance will withstand the action of practically all chemicals except sulphuric acid over 50° B_e, nitric acid over 16° B_e, aniline benzol, carbon bisulphide, chloroform and ethylene dichloride. Defiance has better machining properties.

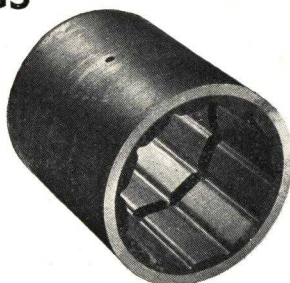


Description	Goodrich	Defiance
Wt. per cu. in.	.045 lbs.	.043 lbs.
Tensile strength (lbs. per sq. in.)	3500 to 5000	6000 to 9000
Softening temperature (under stress 2500 lbs. per sq. in.)	140° F.	130° F. to 135° F.
Impact strength (in lbs. per sq. in. @ 32° F.)	30	60
Transverse strength (lbs. per sq. in.)	9000	15000
Compressive strength (lbs. per sq. in.)	11000	12000
Coefficient of linear expansion per degree Fahrenheit between 32° F. and 140° F.	.000034	.000035
Dielectric strength (volts per mm.)	25000	40000
Moisture absorption (per cent 24 hrs. immersion @ 70° F.)	.02	.018

SOFT RUBBER BEARINGS

Water-lubricated, grit-proof, with less friction than many oil-lubricated bearings. For use wherever oil lubrication is difficult and water for lubrication available.

Goodrich Cutless Bearings have been used with outstanding success in hydraulic turbines, sand and gravel pumps, hydraulic dredges, deep-



well pumps, sand and gravel washers; they are widely known and used in marine service—in fact are rapidly supplanting lignum-vitae, bab-bitt, and bronze for carrying propeller shafts, in all types of craft. Engineering data, to fit any individual problem, will be supplied on request.



PACKING

ASBESTOS SHEET PACKING: SUPERHEAT GRADE

All-service compressed flange and joint packing for steam, air, ammonia, gases, oils, acids, alkalis.

Thicknesses— $\frac{3}{32}$, $\frac{1}{16}$ and $\frac{1}{8}$ in. are standard; $\frac{3}{16}$, $\frac{1}{8}$ and $\frac{1}{4}$ in. made to order.

Size Sheets—50x50 in., 40x40 in., 40x120 in., 60x60 in., 60x120 in., furnished cross-grained unless ordered straight-grained; 50x150 in., straight-grained only.

Graphited one or both sides, as ordered, without extra charge.

List price per pound, \$1.00.



WHITE STAR

Super quality red sheet rubber packing. Extra heat resisting qualities. 36 in. wide; $\frac{1}{16}$, $\frac{3}{32}$ and $\frac{1}{8}$ in. thick. List price, \$0.90 per pound. Can also be furnished with brass wire insertion. List price, \$1.80 per pound.

SUMMIT OIL RESISTING

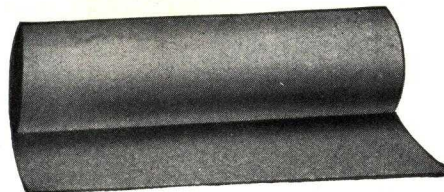
Soft black rubber. High tensile strength and elasticity. Sizes 36 in. by $\frac{1}{16}$ or $\frac{1}{8}$ in. thick. Special thickness made to order in 200-lb. rolls. List price, \$1.00 per pound.

DIAPHRAGM SHEET

For cutting regulator diaphragms. Reinforced with a special flexible fabric. Width 45 in. Thicknesses $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$ and $\frac{1}{4}$ in. List price, \$1.45 per pound.

CLOTH INSERTED SHEET GRADE NO. 60

Width 37 in. Thicknesses $\frac{1}{16}$ and $\frac{1}{8}$ in. For cold water, air and other low pressure service. List price, \$0.58 per pound.



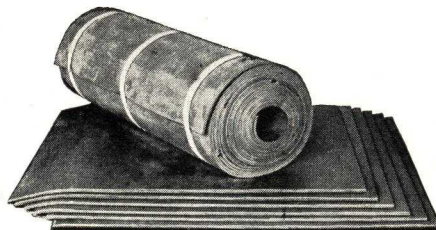
$\frac{1}{16}$, $\frac{5}{8}$, $\frac{11}{16}$, $\frac{3}{4}$, $\frac{13}{16}$, $\frac{7}{8}$, $\frac{15}{16}$, 1, $1\frac{1}{16}$ and $1\frac{3}{16}$ in. List price \$2.35 per pound.

GASKETS

Gaskets can be furnished either plain or graphited from asbestos sheet or rubber sheet in standard sizes or special sizes. Price depends on quantities and sizes.

SHEET AND SLAB RUBBER GRADE 1170

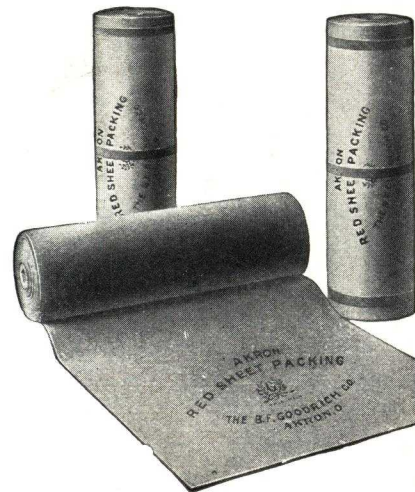
Medium soft gray rubber of good aging quality and tensile strength for gaskets, bumpers and general utility. Specific gravity 1.49. Width 36 in. Thicknesses, $\frac{1}{16}$, $\frac{3}{32}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{16}$, $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ in. List price, \$0.77 per pound.



RUBBER SHEET FOR LOW PRESSURES

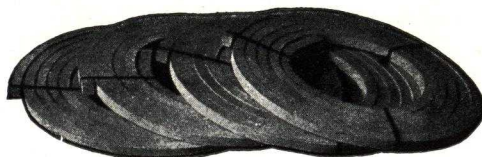
AKRON RED

Standard quality red sheet packing, 36 in. wide in rolls of approximately 200 lbs. $\frac{1}{16}$, $\frac{3}{32}$, $\frac{1}{8}$, $\frac{3}{16}$ and $\frac{1}{4}$ in. thick. For cold water, hot water and low steam pressures. Soft enough to make a good joint with uneven flanges yet firm enough to resist blowing out. List price per pound, \$0.495.



PUMP PACKING B. F. G. GRADE

Closely woven fabric for hot or cold water. Unequalled for gritty conditions or boiler feed pumps. Furnished rock hard when so ordered. Made in coils $12\frac{1}{2}$ ft. long. Sizes $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{16}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{13}{16}$, $\frac{7}{8}$, 1 , $1\frac{1}{8}$ in. List price, \$1.45 per pound.



ARMORITE SHEET RUBBER

Aarmorite is the toughest known compound of rubber. Black in color, soft and elastic. Recommended as a protection against abrasion of sharp materials, wet or dry, in temperatures up to 150° F. Especially effective for lining chutes. In some installations it outwears steel ten to one. Reinforced with a double fabric insertion in the base to serve as an anchorage for screws or nails. Width 48 in.; thicknesses $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ in.

List prices

$\frac{1}{4}$ in.	\$2.50 per sq. ft.
$\frac{3}{8}$ in.	3.75 per sq. ft.
$\frac{1}{2}$ in.	5.00 per sq. ft.

If service involves impact of heavy lumps special thicknesses may be required. Submit inquiry with full information. Aarmorite can also be vulcanized directly to the metal by the Vulcalock process. Prices quoted on receipt of inquiry.

GAUGE GLASS GASKETS

Square section or round section. Sizes $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ in.

Size, in.	List prices per 100	
	Square section	Round section
$\frac{1}{2}$	\$0.91	\$1.09
$\frac{5}{8}$	1.03	1.21
$\frac{3}{4}$	1.34	1.35

METEOR

Similar to B. F. G. Dependable quality for moderate pressures. List price, \$1.27 per pound.

STEAM PACKING—SPIRAL GOODRICH

Fabric and rubber spiral rod packing for steam pressures up to 80 lbs. Lubricated and boxed. $12\frac{1}{2}$ ft. of packing in each spiral. Sizes $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{16}$, $\frac{1}{2}$,



MATS AND MATTING

DELUXE MATS FOR ENTRANCES: GOODRICH CHROMATEX MATS

By a patented process trademarks, insignia, coats-of-arms, monograms and other designs can be molded into the surface of perforated mats in any number of colors. A distinctive and striking advertisement. Price depends on size of mat and design.



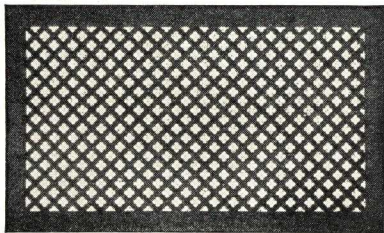
PLAIN PERFORATED MATS

Standard thickness $\frac{3}{8}$ in. Can be furnished in black, red, green or white rubber. Sanitary, easily cleaned. Perforations catch mud and dirt in winter and dust in summer, saving floors and rugs inside the buildings. The most efficient and dignified entrance mat for office buildings, corridors, elevator entrances, stores, hotels, clubs, homes, etc.

	List price
$\frac{3}{8}$ in. thick.....	\$2.20 per sq. ft.
$\frac{1}{4}$ in. thick.....	1.65 per sq. ft.

VULCATEEN DOOR MATS

Very high quality rubber, $\frac{1}{4}$ in. thick. Corrugated surface with a variety of deep rich colors permanently vulcanized in. Two sizes, packed six to the carton, in assorted colors.



Size, in.	List price, each
18x30	\$3.00
24x36	4.15

SWITCHBOARD MATTING: GRADE 5003

Cloth inserted gray rubber. Corrugated surface. Clean compound with high dielectric strength. Made in accord-

PUMP VALVES

Special factory service insures shipment in 48 hours after receipt of order. Valves are made to order in exact sizes and grade ordered. In ordering specify which dimension is thickness and which is diameter of hole. If you do not specify the grade, tell us temperature and pressure, and nature of liquid pumped.

Grade	Hardness	Temp.	Press., lb.	Spec. grav.	List price per lb.
240	Bone-hard	212°	250	155	\$1.18
60	Semi-hard	170°	250	160	1.38
20	Semi-soft	150°	150	189	1.34
305	Soft	170°	50	192	1.84

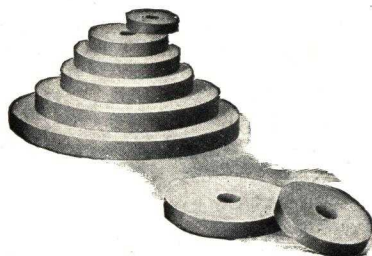
ance with A.S.T.M. electrical requirements. In selecting thickness allow five to one safety factor on dielectric test.

Thickness, in.	Widths, in.	Dielectric strength, volts	List prices per sq. ft.
$\frac{3}{8}$	36	30,000	\$0.615
$\frac{1}{4}$	24, 36, 48	40,000	.78
$\frac{3}{8}$	30, 36, 48	45,000	1.21
$\frac{1}{2}$	36	50,000	1.54

MATting RUNNERS

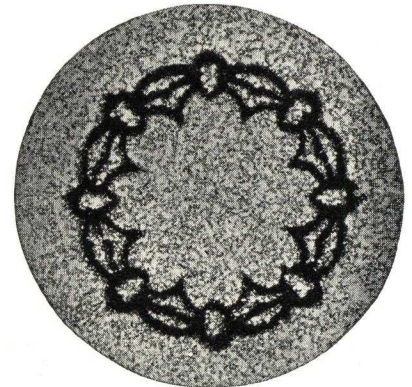
Rubber matting made in rolls and sold by the yard. Corrugated surface, clean cut velvety finish. Grade 5050 jet black. Grade 5055 mahogany.

Width, in.	Thickness, in.	List prices per lineal yard	
		Grade 5050	Grade 5055
24	$\frac{1}{8}$	\$1.21	\$1.49
27	$\frac{1}{8}$	1.32	.....
36	$\frac{1}{8}$	1.76	2.15
48	$\frac{1}{8}$	2.36	2.86
36	$\frac{3}{16}$	2.64	3.85
48	$\frac{3}{16}$	3.52	5.06



CIRCULAR SOLARIUM MATS

Something entirely new. Corrugated surface. Made in beautiful harmonious colors—blue, gold, red and green—not painted on, but impregnated into the rubber for lasting beauty. Useful for flower pots, carafes, cuspidors, coin mats, etc.



Diameter, in.	List price, each
8	\$0.165
10	.22
12	.33
15	.44
18	.66

Per carton: 20 assorted sizes, \$6.60.

TELEPHONE CUSHIONS

Jet black rubber. Fits over telephone receiver to exclude outside noise. One to the box. List price each, \$0.75.

OFFICE CHAIR MATS

Round mats with extension to go under desk. Smooth surface. Pay for themselves in savings to rugs and floor. Lie perfectly flat.



Diameter, in.	Thickness, in.	List prices, each		
		Black	Chocolate	Green
38	$\frac{3}{8}$	\$8.62	\$10.06	.....
38	$\frac{1}{2}$	6.48	8.80	.....
40	$\frac{3}{8}$	9.36	10.94	\$12.90
40	$\frac{1}{2}$	6.96	9.00	.....



GOODRICH VULCALOCK EQUIPMENT

The Vulcalock process is an exclusive, patented Goodrich method of bonding soft resilient rubber directly to the surface of metals with an adhesion exceeding 500 lbs. per sq. in.—practically an integral union. Principal Vulcalock products are:

Vulcalock tanks and tank cars for processing, storage and transportation of acids and other corrosives.

Vulcalock Pipe, Valves and Fittings.

Vulcalock Drums and Barrels.

Vulcalock Fans, Blowers and Pumps.

Rubber covered equipment for abrasive service.

Vulcalock Rolls for Paper Mills, also Steel and Tin Mill Wringer, Scrubber, Galvanizing and Pickling Rolls.

Vulcalock Centrifugal Baskets.



Heavy Duty Vulcalock Steel Pickling Tank with Triflex Rubber Lining ready for installation of sheathing. Inside dimensions 7 ft. 6 in. by 10 ft. 6 in. by 5 ft. 7 in. deep

Special rubber-lined or rubber-covered process equipment.

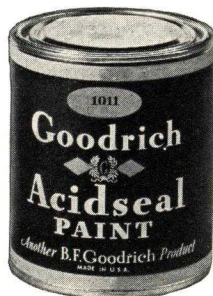
Vulcalock Pickling and Plating Tanks—Metal working plants may now install steel pickling tanks with Goodrich Triflex rubber linings, consisting of hard rubber imbedded in soft rubber. Expansion joints prevent cracking or distortion of hard rubber under temperature changes. Resistance to impact is nearly 100 times that of ordinary rubber linings. Protective sheathings of wood or brick are installed to insure freedom from damage. Brick sheathings also provide temperature drop to insulate rubber from high temperatures. These pickling tanks are leak-proof, durable, economical and can be very easily repaired with very little loss of time. Full information will be submitted on request.

ACID RESISTING PAINT

Goodrich Acidseal Paints, developed and patented by the Goodrich Research Laboratories, possess great adhesive properties, elasticity, resistance to acids, alkalis and moisture.

Uses—Protection against corrosive fumes such as acids, alkalis, salt, etc., for structural steel, pipe lines, machinery walls, tank cars, drums, magnesium-aluminum alloys, laundry equipment; covering of metal sheets subject to flexing; priming coat for nitro-cellulose lacquer films.

Limitations—Deteriorate in direct sunlight. Must not be expected to stand abrasion better than ordinary paint.



Acidseal Paint 1009—Cream color, no priming coat required. List price, \$8.35 per gallon.

Acidseal Paint 1011—Gray. Withstands temperatures up to 220° F. Requires primer of red lead on metal and Goodrich Acidseal Primer No. 3 for concrete. List price, \$9.70 per gallon.

Acidseal Paint 1014—Silver gray. Contains aluminum powder. No priming coat required, although red lead or chromate primers may be used where desired. List price, \$11.00 per gallon.

Acidseal Paint 1021—Brown. Used as a primer for lacquers. List price, \$9.00 per gallon.

All Acidseal Paints can be applied with a brush and dry in about one hour. Sold in gallon cans.

GOODRICH RUBBER CEMENTS AND PLASTIC COMPOUNDS

Goodrich manufactures more than 200 solutions or suspensions of rubber, commonly known as rubber cements. Following is a list of the principal grades. Additional information and prices will be furnished on request.

Goodrich No. 1—Highest quality pure gum rubber cement.

Goodrich No. 4—Same as No. 1, but slightly thinner.

Goodrich Upholstery Cement—For temporary adhesion in assembly work.

Goodrich Wood Rim and Gasket Cement.

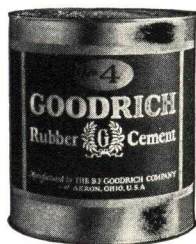
Goodrich No. 3 Railroad Coupling and Steam Hose Cement—For applying hose couplings.

Goodrich "J" Cement—Rapid drying.

Goodrich "M" Cement—Non-toxic, non-freezing solvent.

Goodrich Stationers' Cement—Light color. Non-toxic, non-freezing.

Goodrich Plastikon No. 169—Adheres to wood or metal. Will not become brittle.



Waterseal No. 9—Inserted in wood and metal joints to prevent squeaking. Paste consistency.

Spraying Waterseal DX-12—Same as No. 9 except can be handled with a brush or spray gun.

No. 57 Plastic—Putty-like consistency. Applied with putty knife or paddle. Adheres to metal, wood, leather, etc. Shrinks little, leaving good thick layer when dry.

No. 50 and No. 51—Air-cured type. Two solutions mixed together before use.

Goodrich No. 54 and 55—Similar to Nos. 50 and 51, but with greater strength. Used in making rubber lifeboats and similar processes.

Goodrich Airship Seam Solution No. 1 and No. 2.

Goodrich No. 60 and No. 61—Hot vulcanizing type.

Goodrich No. 52—White vulcanizing cement.

Goodrich No. 53—Black vulcanizing cement.

Goodrich "Jiffy" Solution—Extreme adhesion to leather and rubber.

Containers—Cans of all sizes, 1-qt. and 5-gal., also 30-gal. and 55-gal. drums. Some solutions can also be furnished in 1/4-pt. bottles and various sizes of collapsible tubes.

Rubber cements are volatile and inflammable. Insurance companies require special storage facilities.



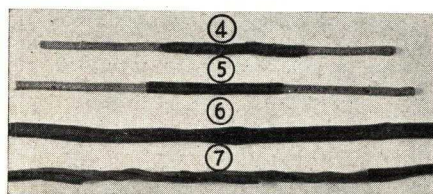
GOODRICH MISCELLANEOUS RUBBER PRODUCTS

TWO-IN-ONE COMBINATION RUBBER AND FRICTION TAPE

Insurance requirements demand that insulation on electrical joints shall be equal to the original insulation on the wire. This safety cannot be insured by the use of friction tape alone. Two-in-one tape provides ample thickness of rubber insulation, plus the friction tape, in one product. Repeated windings are unnecessary. A small piece of the tape folded over the



bare wire is sufficient to provide ample voltage resistance up to 220 volts. A double thickness may be used up to 660 volts. Extremely adhesive. Amalgamates itself with slight pressure. Also useful for mending purposes. Furnished in half pound rolls, 10 lbs. per shipping case. Tested and listed by Underwriters' Laboratories. List price, \$1.35 per pound.



Joints with Two-in-one Tape

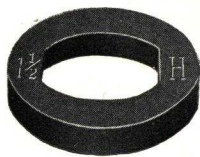
FLEXITE BUCKETS AND DIPPERS

To insure greater safety for workmen in handling corrosive liquids. Made of



GLOBE VALVE DISCS: GOODRICH HIGH DUTY

For replacements in disc-type brass globe valves. Orders should specify oval hole or round hole.



Bone-hard high quality composition affords highest resistance to heat and pressure. Recommended for steam pressures up to 200 lbs. per square inch.

Size, in.	No. to box	List price, each	Size, in.	No. to box	List price, each
1/4	200	\$0.03	3	25	\$.40
3/8	200	.04	3 1/2	25	.50
1/2	200	.04	4	10	.60
3/4	100	.05	4 1/2	10	.70
1	100	.06	5	10	.80
1 1/4	100	.09	6	10	1.00
1 1/2	50	.12	7	10	1.20
2	50	.18	8	10	1.40
2 1/2	50	.24			

PUMP DIAPHRAGMS

Designations refer to size and make of pump for which diaphragm is desired. Loud diaphragms may also be used on Deming pumps and Edson diaphragms on Rumsey pumps.



Size	List price, each	Size	List price, each
No. 1 Loud	\$1.94	No. 4 Edson	\$3.76
No. 2 Loud	2.62	No. 2 Gould	2.40
No. 2 Edson	2.40	No. 3 Gould	2.88
No. 3 Edson	2.88	No. 4 Gould	3.76

Goodrich Flexite, a flexible hard rubber. Nothing short of actual destructive abuse will crack or break it. Lead covered handle, fitted in such a manner as to permit nesting of buckets.



	List price, each
Buckets {Lead covered handles..	\$12.10
{Rubber covered handles	13.80
2-qt. dippers.....	7.30
1-qt. dippers.....	5.60

SPONGE RUBBER

Made in slabs 20x20 in. Suitable for gaskets, cushions, packings, pads, vibration insulators and hundreds of other uses.

Grade A—Red, medium soft, medium weight.
Grade B—Black, firm and heavy.
Grade C—Tan, very soft and light.
Grade E—Black, soft, medium weight.



LIST PRICES PER SLAB 20x20 INCHES

Thickness, in.	A Red	B Black	C Tan	E Black
1/8	\$1.14	\$1.56	\$1.28	\$1.14
1/8*	.77	.....	.....	.77
1/4	1.34	1.98	1.36	1.34
1/4	1.43	2.32	1.63	1.47
3/8	1.69	2.42	1.91	1.72
3/8	1.89	2.66	2.18	1.98
1/2	2.09	.....	2.35	2.31
1/2	2.27	3.30	2.53	2.53
3/4	2.77	4.18	2.62	3.01
3/4	3.41	4.75	2.93	3.45
1	4.03	5.96	3.70	4.49

*Skin one side only.

RESPIRATORS

A safety appliance for the protection of workmen from dust and smoke. White soft rubber furnished complete with straps, sponges, valves, etc. One to the box. List price, \$1.35 each.



ANODE GLOVES

Made by exclusive Goodrich Anode process imparting much greater toughness and resistance to wear than ordinary gloves.



Cat. No.	Type	Lgth., in.	Sizes	Pairs per box	List price per doz. pairs
2914	G'tlet, acid	14	8 1/2 9 1/2 10 10 1/2 11	1	\$30.00
2924	G'tlet, fabric lined, acid	14	10 1/2 11	1	54.00
2918	G'tlet, acid	18	10 10 1/2 11	1	36.00
570	Industrial, no g'tlet	11	9 10 10 1/2 11	6	16.00
560	Household, no g'tlet	11	6 1/2 7 7 1/2 8 8 1/2 9 9 1/2 10 10 1/2 11	12	6.40

DISTRIBUTORS OF GOODRICH INDUSTRIAL SUPPLIES

ALABAMA

BIRMINGHAM Young & Vann Supply Co.

ARKANSAS

BLITHEVILLE Hubbard Hdwe. Co.
HOT SPRINGS F. C. Stearns Hdwe. Co.
LITTLE ROCK Central Supply Co.

CALIFORNIA

LOS ANGELES Los Angeles Rubber & Asbestos Co.
..... Republic Supply Co. of Calif.
SAN DIEGO Hazard-Gould Corp.
SAN FRANCISCO Dunham-Carrigan-Hayden Co.
..... H. L. Parkman Co.
SAN JOSE Farmers Union

COLORADO

DENVER Harry H. Post Co.
GRAND JUNCTION Salt Lake Hardware Co.
PUEBLO Holmes Hdwe. Co.

DELAWARE

WILMINGTON Wood-Krewson Co.

DISTRICT OF COLUMBIA

WASHINGTON Standard Automotive Supply Co.
..... Raymond & Burke

FLORIDA

JACKSONVILLE S. B. Hubbard Co.
ORLANDO Harry P. Leu, Inc.
TALLAHASSEE Seabrook Hardware Co.

GEORGIA

ATLANTA Beek & Gregg Hardware Co.
AUGUSTA Lombard Iron Works & Supply Co.
MACON Schofield Iron Works
SAVANNAH Jno. D. Robinson Co.
THOMASVILLE Thomasville Hdwe. & Supply Co.

IDAHO

BOISE Salt Lake Hardware Co.
POCATELLO Salt Lake Hardware Co.

ILLINOIS

CAIRO Woodward Hdwe. Co.
CHICAGO W. D. Allen Mfg. Co.
DECATUR Morehouse & Wells Co.
JACKSONVILLE Jacksonville Farm Supply Co.
OLNEY Hudson-Hill Company

INDIANA

INDIANAPOLIS Central Rubber & Supply Co.

KANSAS

KANSAS CITY Stone, L. R. Supply Co.

KENTUCKY

LEXINGTON Wilson Machinery & Supply Co.
LOUISVILLE Louisville Mill Supply Co.
PADUCAH Farr-Better Supply Co.

LOUISIANA

MONROE Monroe Hdwe. Co.
NEW ORLEANS R. J. Tricon Co.
SHREVEPORT L. N. Pevey

MAINE

PORTLAND Portland Rubber Co.

MARYLAND

CUMBERLAND Tri-State Mine & Mill Supply Co.

MASSACHUSETTS

BOSTON Curry Bros. Oil Co.
..... C. J. McCarty Co.
FALL RIVER Fall River Rubber Co.
FITCHBURG Hope Rubber Co.
LAWRENCE Lawrence Rubber Co.
NEW BEDFORD New Bedford Rubber Co.

MICHIGAN

DETROIT C. L. Grandsen & Co.
FLINT C. L. Grandsen & Co.
GRAND RAPIDS Barclay, Ayers & Bertsch
KALAMAZOO Jos. E. Loughhead Co.
PETOSKEY McCabe Hdwe. Co.
SAGINAW Reichle Supply Co.

MINNESOTA

DULUTH Wm. B. Arper Co.
ST. PAUL Goodrich Silvertown Inc.

MISSOURI

JOPLIN Joplin Supply Co.
KANSAS CITY Pioneer Equipment Co.
..... L. R. Stone Supply Co.
ST. LOUIS O. B. Avery Co.
..... Witte Hdwe. Co.

MONTANA

KALISPELL Kalispell Mercantile Co.

NEBRASKA

LINCOLN Henkle & Joyce Hdwe. Co.

NEW HAMPSHIRE

MANCHESTER Hope Rubber Co.

NEW MEXICO

SANTA FE Santa Fe Builders Supply Co.

NEW YORK

ALBANY Sager-Spuck Supply Co.
BINGHAMTON Ellis W. Morse Co.
BOLIVAR R. B. Moore Co.
BUFFALO Don F. Johnson Co.
JAMESTOWN Lundquist Hardware, Inc.
NEW ROCHELLE Commercial Garage & Service Co.
NEW YORK Topping Bros.
OLEAN Miller Hardware Co.
POUGHKEEPSIE Walter F. Wheeler Inc.
WATERTOWN Kamargo Supply Co.

NORTH CAROLINA

FAYETTEVILLE Cape Fear Supply Co.
HAMLET Carroll-Hoe Saw Service
WILMINGTON Hyman Supply Co.

OHIO

AKRON M. F. Murdock Company
CLEVELAND Geo. Worthington Company
COLUMBUS Columbus Belting & Supply Co.
DAYTON Sterling Rubber Products Co.
FINDLAY Ohio Pipe Co.
NEWARK Universal Supply Co.
NEW PHILADELPHIA Sharp Mfg. & Supply Co.
TOLEDO Union Supply Co.
YOUNGSTOWN Stambaugh-Thompson Co.

OKLAHOMA

OKLAHOMA CITY Land Supply Co.
TULSA Lucey Products Corp.
..... Tulsa Rubber Products Co.

OREGON

PORTLAND Pacific States Rubber Co.

PENNSYLVANIA

ALLENTOWN H. N. Crowder, Jr. Co.
BRADFORD Lloyd, Smith Co.
CHESTER John Bridge's Sons
EASTON H. N. Crowder, Jr. Co.
ERIE United Hardware & Supply Co.
HARRISBURG Appleby Bros. & Whittaker Co.
PHILADELPHIA Belmont Packing & Rubber Co.
..... Theo. C. Ulmer, Inc.
PITTSBURGH Speck Marshall Company
READING Brown Engineering Co.
SCRANTON Chas. B. Scott Co.
WILLIAMSPORT Carl Wentzler Tire Shop

RHODE ISLAND

PROVIDENCE Hope Rubber Co.

SOUTH CAROLINA

GREENVILLE Carolina Supply Co.
SUMTER B. L. Montague

TENNESSEE

CHATTANOOGA James Supply Co.
KINGSPORT Ship-not Belting Corp.
KNOXVILLE Tennessee Mill & Mine Supply Co.
MEMPHIS Pidgeon Thomas Iron Co.
NASHVILLE Keith-Simmons Co. Inc.

TEXAS

AMARILLO Cal Farley Tire Shop
CORPUS CHRISTI San Antonio Machine & Supply Co.
DALLAS Briggs-Weaver Mch. Co.
ELECTRA Decker Tool & Supply Co.
EL PASO Tri-State Sales Co.
FT. WORTH Marlow Belting & Hose Co.
HOUSTON W. H. Steigerwald Co.
JOINERVILLE Decker Tool & Supply Co.
SAN ANTONIO San Antonio Machine & Supply Co.
WACO San Antonio Machine & Supply Co.

UTAH

SALT LAKE CITY Salt Lake Hardware Co.

VERMONT

BARRE Reynolds & Sons

VIRGINIA

EMPORIA W. T. Tillar Co.
HARRISONBURG E. T. Garber & Sons
NEWPORT NEWS Noland Co.
PULASKI C. I. Hiltzheimer
RICHMOND Richmond Rubber Co.
..... Terry Bros. Belting Co.
ROANOKE Graves Humphreys Hdwe. Co.

WASHINGTON

HOQUIAM F. G. Foster Co.
OLYMPIA Olympia Supply Co.
RAYMOND F. G. Foster Co.

WEST VIRGINIA

FAIRMONT Fairmont Supply Co.
MARTINSBURG W. H. Heiston & Son
PARKERSBURG Parkersburg Supply Co.
WHEELING Penna. & W. Va. Mine Supply Co.

WYOMING

CASPER Casper Supply Co.

BRITISH COLUMBIA

VANCOUVER Fleck Bros. Ltd.

HONOLULU

HONOLULU, T. H. Honolulu Iron Works Co.

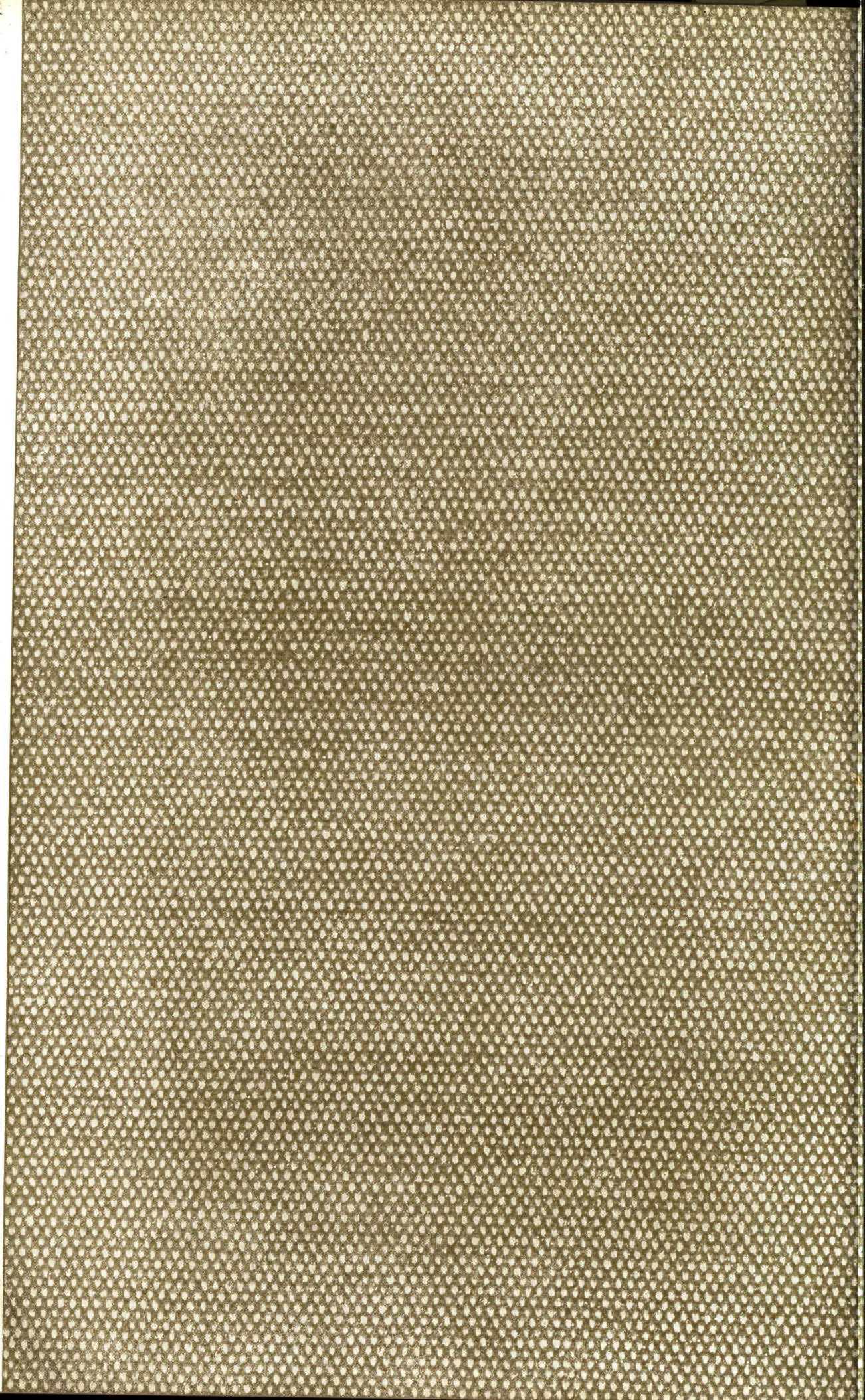
NEW BRUNSWICK

ST. JOHN Estey & Co.

QUEBEC

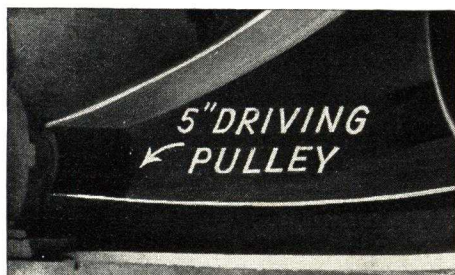
QUEBEC Rene Talbot

B.F. Goodrich

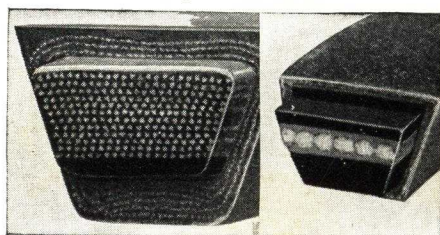


THE MANHATTAN RUBBER MFG. DIVISION OF RAYBESTOS-MANHATTAN, INC.

EST. 40 YEARS

EXECUTIVE OFFICES AND FACTORY
PASSAIC, N. J.BIRMINGHAM, ALA., 1108 North Fifth Avenue
BOSTON, MASS., 10 High Street
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CLEVELAND, OHIO, 259 Rockefeller BuildingDETROIT, MICH., 620 Fisher Building
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NEW ORLEANS, LA., 1007 Camp Street
NEW YORK, N. Y., 120 BroadwayPHILADELPHIA, PA., Broad Street Station
Building
PITTSBURGH, PA., 997 Union Trust Building
ST. LOUIS, MO., 1606 Pine Street

Compensated Belt

Plycord Whipcord
Condor V-Belts
Condor
LINE

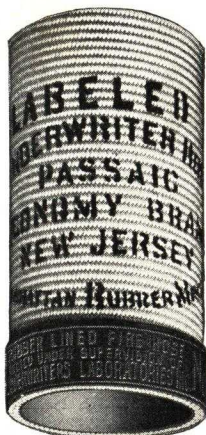
Compensated Belt	Hydraulic Hose
Standard Belt	Packers' Hose
Silver Edge Belt	Paper Mill Hose
V-Belts	Sand Suction Hose
Conveyor Belt	Sand Blast Hose
Chute Lining	Steam Hose
Acid Hose	Water Hose
Air Hose	Cast Iron Air Tubing
Brewers' Hose	Dredge Sleeves
Creamery Hose	Textile Mill Specialties
Contractors' Hose	Rubber-Covered Rolls
Launder Lining	and Rubber-Lined
Fire Hose	Tanks
Garden Hose	Asbestos Brake Blocks
Industrial Brake Lining	

Brewers Hose

Our hose is of the finest and sturdiest construction. It is supplied in three standard grades—Master (amber tube and cover), Condor (red tube and cover), and Kortlandt (black tube and red, white, or black cover). Each grade has a thick, heavy tube and is reinforced with plies of strong cotton duck. The hose will not kink or collapse, and it may be used for suction duty if necessary. Manhattan Brewers Hose will meet your every requirement.



Condor Rubber Hose



Fire Hose

Compensated Belt

A Low Tension Rubber Belt

This belt has a special, patented, construction designed to compensate within its own structural members for the uneven ply stresses incurred when a standard belt is flexed around a small pulley. The outside plies, which are invariably subject to greater stress than the inside plies, are compensated to distribute the ply stress evenly to all the plies, thus raising the efficiency of the belt and greatly prolonging its useful life. This fact has been conclusively proven after several years of unparallel belt testing. The Compensated Belt has ten advantages over standard rubber belt. Write for full details.

Condor Belt

Standard and Raw Edge Construction

Condor is our best grade of standard rubber transmission belting. It is the original *Red Friction Surface* Belt and has been in wide use for over 30 years. It is supplied in all sizes for every belting purpose, and made of specially-treated strong cotton duck, bonded into a flexible, long-lasting homogeneous, moisture-proof, inseparable structure. Condor will give satisfactory service under severe operating conditions. Write for prices.

Condor V-Belts

The new Condor V-Belt embodies two distinct constructions: Whipcord for high-speed, light-duty drives; Plycord for heavy-duty service. Each type has demonstrated marked advantages. Life is increased 29.4% to 358.2%. Stretch is reduced to 1.9% maximum, compared to 6.6% for usual constructions. Flexibility is ample for all running speeds and sheave sizes. Internal heat, the enemy of V-Belts, is reduced to surprisingly low limits. Write for our V-Belt Engineering Data Book and obtain full information about this truly remarkable V-Belt.

Condor Conveyor Belts

Nearly every conveyor and elevator belt installation can be efficiently operated with a Condor Conveyor Belt. This belt, because of a newly-discovered construction principle, is far superior to any other type of conveying belt we have manufactured during the past 40 years. Its advantages and exceptional points are: Extreme flexibility—troughs perfectly in thick ply and long narrow belts, reduced stretch, longer life, inseparable cover, and puncture-proof construction. Let us design and furnish a Condor Conveyor Belt to meet your particular installation requirements. Write today.

Condor Hose

We can supply any type or size of hose from the common garden kind to the largest size of suction hose. Every type is constructed of the highest grade materials and will give satisfactory service under the severest operating conditions. For oil, paint, lacquer and the handling of all materials known to be harmful to rubber, we recommend our Parinite G.O.P. Hose (Gas-Oil-Proof). Specify service when writing for prices, and we will designate the correct hose for the job.

Industrial Brake Linings

Condor Asbestos Brake Blocks and Linings are widely known to industry for their effectiveness, long life, and reliability. Made in all sizes and shapes for hoisting engines, cranes, friction clutches, steam shovels, draglines, elevators, etc. Write for prices and briefly describe your installation requirements.



Condor Conveyor Belt

MANHEIM MANUFACTURING & BELTING COMPANY

Manufacturers of Veelos Balata Belting

MAIN OFFICE AND FACTORY

MANHEIM, PA.

BRANCH OFFICES AND WAREHOUSES

NEW YORK, N. Y., 350 Broadway

CHICAGO, ILL., 565 W. Washington Boulevard

Products

VEELOS *Genuine* BALATA BELTING for power transmission, axle lighting or generator belts on railroads, etc. For use in conveying and elevating of crushed stone, sand, gravel, ore and similar service.

Also makers of Veelos Balata Valves for cold water and oil well pumps.

Advantages of Veelos Balata Belting

Among the outstanding advantages of Veelos *Genuine* Balata Belting may be enumerated:

(1) Enormous tensile strength.

(2) Water-proof and steam-proof, and is not affected by atmospheric changes.

Maximum gripping power is retained under severe operating conditions.

(3) It will transmit full power *without* loss.

(4) Cannot stretch or shrink.

(5) Uniform in texture and thickness insuring true and smooth running on the pulleys.

How Veelos Balata Belting Is Made

Made from selected long staple cotton duck, impregnated with best quality pure Balata gum. The duck is woven to our own specifications and it is one of the most powerful, compact and non-stretching fabrics in existence. By our exclusive Veelos Impregnation Process, the belting is made waterproof and steamproof and, therefore, *is not affected by moisture or atmospheric changes, nor will it shrink or stretch*. It should not, however, be run in temperature exceeding 120° F. The Veelos process welds the plies together so powerfully that the finished belting is practically homogeneous in construction and wears down to the last ply.

Great Tensile Strength

Before leaving the factory every Veelos Balata Belt is thoroughly stretched to the full limit on powerful machinery especially devised for that purpose. Veelos *Genuine* Balata Belting possesses maximum tensile strength. Our method of manufacture gives a uniform tension throughout the entire length of the belt and insures absolute uniformity in width, thickness and balance which is essential to true and smooth running on the pulleys.

Extraordinary Gripping Power

Veelos *Genuine* Balata Belting is unsurpassed for hard drives and heavy duty work. Our manufacturing process gives the belting great flexibility and the minute vacuum cups formed by the surface structure of the material *give it extraordinary gripping power*. With the exercise of reasonable care, slippage is impossible.

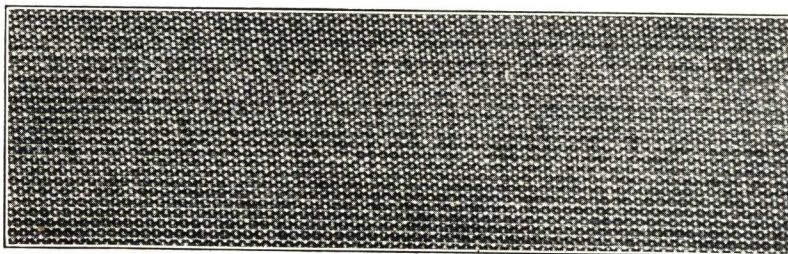


Veelos *Genuine* Balata Belting transmits *all* the power without loss.

Great Reliability, Durability and Economy

Pure Balata gum does not deteriorate with age. Being an integral part of Veelos *Genuine* Balata Belting the gum contributes greatly to its durability and strength. Because of its long life, and the fact that it requires practically no care or attention, stoppages and breakdowns are avoided.

Thus production schedules are maintained and a definite economy is effected through the elimination of lost time and repair expense. Veelos *Genuine* Balata Belting is thoroughly reliable and extremely economical on a service basis.



Section of Veelos Balata Belting

Comparative Transmission Qualities of Veelos Balata Belting and Leather

We recommend the following plies when making comparison with the best quality leather belting:

Veelos	Leather
3-ply	Medium single
4-ply	Heavy single
5-ply	Medium double
6-ply	Heavy double
8-ply	Triple

PULLEY AND BELTING SIZES

Diameter of pulley, in.	Number of plies Veelos recommended
5	4
8	5
12	6
14	7
16	8
18	9
20	10

Note: For pulleys less than 4 in. in diameter use 3-ply Veelos.

Veelos Belting for Conveyor and Elevator Service

Because of its endurance, great tensile strength and wear-resisting qualities, Veelos *Genuine* Balata is recommended for wet and abrasive service. It is particularly adapted for use in the conveyance and elevation of crushed stone, sand, gravel, ore, etc., under either wet or dry conditions.

It troughs sufficiently for this service and wears slowly and evenly down to the last ply. This results in a comparatively low service cost.

Service and Delivery

Our Engineering Department will be glad to make a careful study of individual belting problems. Upon receipt of specifications, we will be pleased to recommend the correct size of Veelos Balata Belting for each requirement.

All regular sizes are carried in stock for immediate shipment. Special sizes shipped within twenty-four to forty-eight hours after receipt of order.

BALDWIN-DUCKWORTH CHAIN CORPORATION

SPRINGFIELD, MASS, U. S. A.

FACTORIES AT WORCESTER AND SPRINGFIELD, MASS.

PRODUCTS

CHAINS AND SPROCKETS
for

POWER TRANSMISSION, CONVEYING AND ELEVATING

STEEL ROLLER CHAINS	BLOCK CHAINS
STEEL REPLACEMENT CHAINS	SPECIAL PURPOSE CHAINS
NON-CORROSIVE AND RUST-RESISTING CHAINS	
OIL FIELD CHAINS	PRECISION SILENT CHAINS
AUTOMOTIVE TIMING CHAINS	
TRUCK CHAINS	ACCURATE CUT SPROCKETS
ENGINEERING SERVICE	

Baldwin-Duckworth Roller Chains

The Baldwin-Duckworth line of roller chains is complete for every industrial purpose—power transmission, conveying, material handling. The standard series includes all sizes from $\frac{3}{8}$ to $2\frac{1}{2}$ ins. pitch, inclusive, and supplementing the standard chains we offer a wide variety of special purpose attachments and special chains designed to meet specific conditions.

The high efficiency of the roller chain drive, universally recognized, is due to the flexibility and smoothness of its power transmission, the very great decrease in friction, and to its more dependable operation. The roller chain drive combines the desirable flexibility of the belt with the positive action of the gear, without the disadvantages of the slipping or stretching belt, or the friction loss, noise and decrease in power of the gear.

The scope of roller chain drives has been greatly widened through the constantly increasing application of the compound or multiple width roller chains. These compound chains provide the power and strength necessary for heavy work, and can be designed to occupy much smaller space where this limitation is encountered. They will wear longer because of even load distribution, than individual chains run in parallel.



Baldwin-Duckworth Standard Roller Chains are made in riveted type from $\frac{3}{8}$ to $\frac{3}{4}$ in. pitch inclusive, and from $\frac{3}{4}$ to $2\frac{1}{2}$ ins. pitch inclusive in riveted or detachable.

The tabulation shown on this page covers Standard Series Chains, these comprising the best proportioned roller chains now made and carried in stock at our factories and by our agents. It is suggested that designers and engineers who find this data insufficient for their needs send for catalogue or submit the problem to Baldwin-Duckworth Engineering Department.

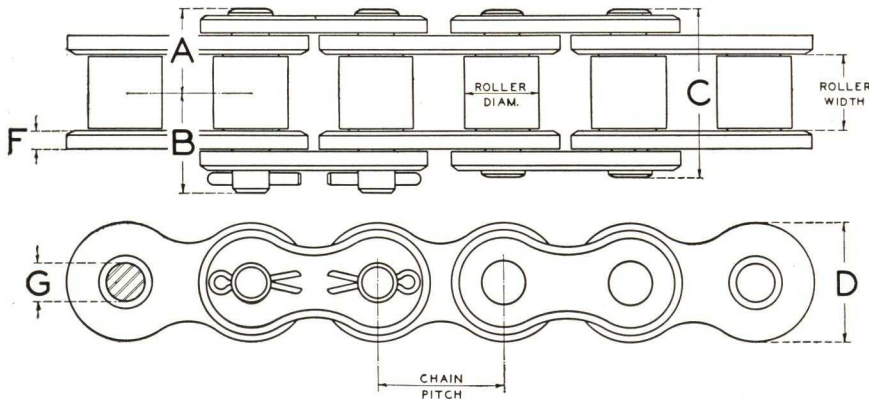
Special Purpose Conveying and Elevating

Roller Chains can be readily adapted to a great variety of uses by means of special links or extended pins assembled into the Standard Chains. Complete details, together with illustrations of the various types of special links for these purposes are contained in our catalogue.

We carry in stock many standard sizes and are prepared to build according to needs special links for riveting, conveying, either in package or bulk, timing operations, feeding of material to or through automatic machines.

Sprockets

A wide range of sizes is carried in stock to fit all Standard Roller Chains. Special sprockets of all types and sizes can be made promptly to specifications.



DIMENSIONS—STRENGTHS—WEIGHTS

Standard Chain Number	Baldwin-Duckworth Number	Chain Pitch, ins.	Roller width, ins.	Roller diam., ins.	Average ultimate Strength, lbs.	A	B	C	D	F	G	Weight per ft.	
						in.	in.	in.	in.	in.	in.	Riveted, lbs.	Detachable, lbs.
Standard Series Chains													
35N	35N	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	2000	.235	.265	.47	.35	.050	.141	.203	...
40	116	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	3600	.31	.37	.62	.45	.060	.156	.323	.437
50	108	$\frac{5}{8}$	$\frac{5}{8}$	$1\frac{1}{4}$	5800	.39	.48	.78	.52	.080	.200	.564	.687
60	60	$\frac{3}{4}$	$\frac{3}{4}$	$1\frac{1}{2}$	6000	.483	.563	.97	.66	.094	.234	.97	1.07
80	80	1	1	$1\frac{3}{4}$	12500	.62	.74	1.24	.78	.125	.312	1.63	1.65
100	100	$1\frac{1}{4}$	$1\frac{1}{4}$	$2\frac{1}{4}$	21000	.76	.91	1.51	1.12	.156	.375	2.50	2.60
120	120	$1\frac{1}{2}$	1	$2\frac{1}{2}$	30500	.94	1.13	1.89	1.32	.187	.437	3.60	3.67
140	52	$1\frac{3}{4}$	1	$2\frac{3}{4}$	41000	1.02	1.22	2.04	1.58	.220	.500	4.80	5.00
160	53	2	$1\frac{1}{4}$	$1\frac{1}{2}$	53000	1.21	1.45	2.42	1.78	.250	.562	6.90	7.10
200	200	$2\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	90000	1.48	1.85	2.96	2.14	.312	.781	9.95	10.40

AMERICAN CABLE COMPANY, INC.

AN ASSOCIATE COMPANY OF THE AMERICAN CHAIN COMPANY, INCORPORATED

Manufacturers of Wire Rope and Fittings

WILKESBARRE, PENNSYLVANIA

ATLANTA

PITTSBURGH

CHICAGO

DISTRICT OFFICES

DENVER
SAN FRANCISCO

DETROIT

TULSA

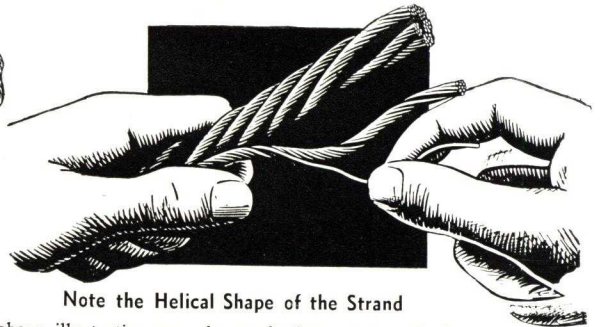
PHILADELPHIA

Products

TRU-LAY *Preformed* WIRE ROPE.
CRESCENT (non-preformed) WIRE ROPE.
TRU-LAY and CRESCENT WIRE ROPE SLINGS.
WIRE ROPE FITTINGS, HOOKS, SOCKETS,
THIMBLES, etc.
Tru-Loc Wire Rope Processed Fittings.



TRADE-MARK



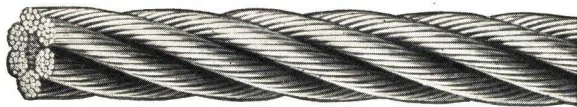
Note the Helical Shape of the Strand

The above illustration was also made from an actual photograph. You can unwind a strand from Tru-Lay *Preformed* Wire Rope, and you can unwind a wire from the strand exactly as shown above. Both wire and strand fit perfectly in position again.

Tru-Lay *Preformed* Wire Rope

In Tru-Lay *Preformed* Wire Rope, wires and strands are shaped to the exact form they assume in the completed rope. *Preforming* removes internal torsional stress, because wires and strands lie side by side naturally—without straightening-out tendencies.

Tru-Lay *Preformed* Wire Rope resists kinking, high and low stranding and is easier to handle. Tru-Lay will not rotate in drum grooves. Thus Tru-Lay gives much longer service over non-preformed rope of the same grade and construction.



The above illustration of Tru-Lay *Preformed* Wire Rope was made from an actual photograph. Note that it is not necessary to seize the end, because the strands and wires lie in position without internal torsional stress. With Wire Rope that is *not* preformed, the strands and wires straighten out and unravel when cut unless the end is firmly seized with several wrappings of wire.

Crescent Wire Rope

Crescent Wire Rope is *not* preformed and is recommended in instances where operating conditions are such that *preformed* wire is not necessary. Our many years of experience with both types of wire rope enable us to make the proper recommendations.

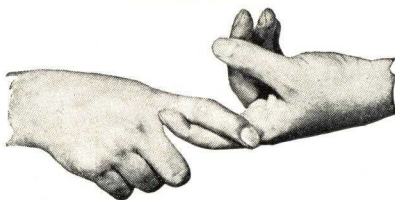
Slings, Fittings, Hooks, Sockets and Thimbles

Send for Catalogue for full particulars about AMERICAN CABLE COMPANY'S Wire Rope Slings and Wire Rope Fittings.

Literature

Literature and prices covering all types of Tru-Lay *Preformed* Wire Rope, Crescent Wire Rope, Tru-Loc Fittings, Regular Wire Rope Fittings and Slings furnished on request.

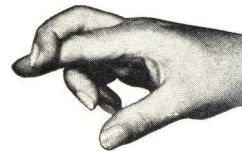
Illustrating Tru-Lay *Preformed* Wire Rope Construction



**HOLD YOUR HANDS
LIKE THIS**

Note how lightly your fingers lie against each other—without pressure or strain. The strands and wires of Tru-Lay *Preformed* Wire Rope fit the same way—without internal torsional stress.

Illustrating Non-preformed Wire Rope Construction



**CROSS YOUR FINGERS
LIKE THIS**

Note the strain which you feel in both of your fingers. Note also the pressure between your fingers. The strands and wires in *non-preformed* wire rope are frequently under the same internal torsional stress.

AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

Manufacturers of Wire Rope and Fittings

SALES OFFICES

CHICAGO, 208 So. LaSalle Street
CLEVELAND, Rockefeller Building
DETROIT, Buhl Building
CINCINNATI, Union Trust Building
ST. PAUL, First National Bank Building
MILWAUKEE, 850 Bankers Building
ST. LOUIS, 506 Olive Street

NEW YORK, Empire State Building
KANSAS CITY, 417 Grand Avenue
OKLAHOMA CITY, Ramsey Tower
BIRMINGHAM, Brown-Marx Building
MEMPHIS, Sterick Building
DALLAS, Praetorian Building
DENVER, First National Bank Building
SALT LAKE CITY, Walker Bank Building

BOSTON, Statler Building
PITTSBURGH, Frick Building
PHILADELPHIA, Widener Building
ATLANTA, 696 Whitehall Street, S. W.
WORCESTER, 94 Grove Street
BALTIMORE, First National Bank Building
BUFFALO, 670 Ellicott Street
WILKES-BARRE, Miners Bank Building

PACIFIC COAST DISTRIBUTORS, COLUMBIA STEEL COMPANY

SAN FRANCISCO, Russ Building
LOS ANGELES, 2087 E. Slauson Avenue

PORTLAND, 777 Nicolai Street
SEATTLE, 4th Avenue So. and Connecticut Street

EXPORT DISTRIBUTORS, United States Steel Products Company, 30 Church Street, NEW YORK, N. Y.

Products

All kinds of WIRE ROPE in the following grades: Iron, Traction Steel, Cast Steel, Extron Cast Steel, Plow Steel and Monitor Steel Silver Strand.

Also a full line of Wire Rope Fittings: Slings, Thimbles, Clips, Clamps, Sockets, Hooks, Turnbuckles, etc.

For our pages on Electrical Wires and Cables and Concrete Reinforcement, see Manufacturers' Index.

Wire Rope and Its Uses

Wire rope is made in the following six grades:

Iron Rope—The wires are made from the best quality iron, being soft, tough and flexible. Iron hoisting ropes are used for counterweight ropes and operating ropes on hydraulic elevators; and governor ropes on electric elevators.

Traction Steel Rope—This grade was designed to meet the requirements of the present day high speed electric traction elevators. Of specially selected Open Hearth Steel, these ropes have approximately twice the strength of the iron ropes formerly used for elevator purposes.

Cast Steel Rope—A medium strength material, tough and pliable, of moderate cost and general utility. Weighs only about half as much as iron for same strength; is harder, and better resists external wear. This rope is applicable to a great variety of uses.

Extron Cast Steel Rope—Of higher tensile strength than the cast steel, and is tough, pliable, a little lighter for the same strength than cast steel, and about two and one-half times the strength of iron. It has been found particularly useful for oil well drilling and tubing lines.

Plow Steel Rope—Combines lightness and great strength; is somewhat stiffer than cast steel.

Monitor Silver Strand Steel Rope—This is the highest strength rope made. It is somewhat stiffer in the same diameter than the plow and cast steel grades, but, strength for strength, it is equally flexible. Very useful where great strength, lightness and abrasive resisting qualities are required. Is identified by having one galvanized strand throughout entire length.

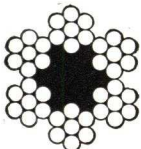


Fig. 1

Transmission or Haulage Rope

The coarsest rope *i.e.*, 6x7 construction, a relatively stiff rope with large wires, capable of resisting external wear or abrasion; but it is the least flexible. (See Fig. 1.)

Hoisting Rope

Composed of 6 strands of 19 wires each, with hemp core. Used for elevators, mine hoisting, derricks, dredges, cableways, logging, inclined planes, coal hoists, conveyors, ballast unloaders, skip hoist, oil well drilling and tubing lines. (See Fig. 2.)

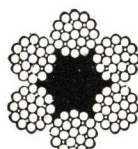


Fig. 2

Extra Flexible Hoisting Rope

This rope is composed of 8 strands of 19 wires each, laid



around a hemp core. The addition of these two strands over the standard hoisting rope increases the flexibility and permits the rope being used over comparatively smaller sheaves and drums. Adaptable for derricks, steam dredges, coal and ore handling machinery, pile drivers, and also for logging purposes, as well as tubing lines for oil wells. (See Fig. 3.)

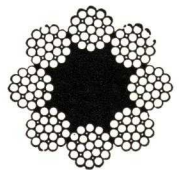


Fig. 3

Seale Patent Traction Steel Elevator Rope

Seale Patent Traction Elevator Rope is a rope designed specially to give maximum resilience, flexibility and tractive effort, combined with smooth running qualities. It is composed of 8 strands of 19 wires each, laid around a hemp core. This rope gives excellent service on all "U" and "V" groove traction installations.

These ropes give additional wearing surface owing to the somewhat larger wires, less wear on the sheaves and drums due to better contact and less slippage.

Altogether, this rope possesses many desirable features not found in other styles of elevator ropes. (See Fig. 4.)

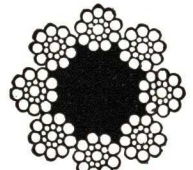


Fig. 4

Special Flexible Hoisting Rope

This rope, usually composed of 6 strands of 37 wires each, laid around a hemp core, is also manufactured in 6x29 and 6x33 constructions. These special constructions are specially adapted for dredging, clamshell bucket work, locomotive cranes, shovels, etc. For details of these special constructions, see nearest Sales Office. (See Fig. 5 for 6x37 construction.)

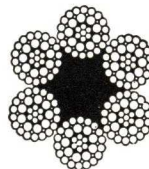


Fig. 5

Extra Special Flexible Hoisting Rope

Composed of 6 strands of 61 wires each, with hemp core, and recommended for dredging purposes, for which it is usually made with special wire center. (See Fig. 6.)

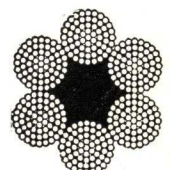


Fig. 6

Flattened Strand Hoisting Ropes

These ropes compare in flexibility with the standard hoisting rope, but possess about 150% greater wearing surface than the round strand ropes of same diameter and have been used generally in the same places.

(Fig. 7 shows Type A, 5x28, and Fig. 8 shows Type B, 6x25.)

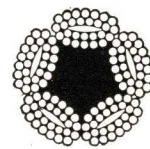


Fig. 7

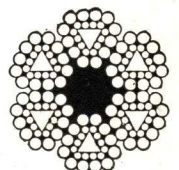


Fig. 8

VARIOUS CONSTRUCTIONS AND GRADES OF WIRE ROPE

		Iron		Cast Steel		Extron Cast Steel		Plow Steel		Monitor Steel, Silver Strand	
Diameter, inches	Weight per foot, pounds	Breaking strength in tons of 2000 pounds, each	List price per foot	Breaking strength in tons of 2000 pounds, each	List price per foot	Breaking strength in tons of 2000 pounds, each	List price per foot	Breaking strength in tons of 2000 pounds, each	List price per foot	Breaking strength in tons of 2000 pounds, each	List price per foot
Transmission, Haulage or Standing Rope—6 Strands, 7 Wires to Strand, 1 Hemp Core											
1 1/2	3.38	29.7	\$0.51	62.5	\$0.60	68.7	\$0.75	75	\$0.90	86.5	\$1.05
1 3/8	2.84	25.2	.43	53	.51	58.2	.64	63.5	.76	73.5	.88
1 1/4	2.34	21	.36	44.5	.43	48.7	.53	53	.62	61	.72
1 1/8	1.90	17.2	.30	36.4	.36	40	.44	43.6	.51	50	.58
1	1.50	13.7	.24	29	.29	31.9	.35	34.8	.41	40	.48
7/8	1.15	10.5	.18 1/2	22.4	.23	24.6	.27	26.8	.32 1/2	30.8	.37
3/4	.84	7.86	.14	16.5	.18 1/2	18.1	.22	19.8	.26	22.8	.28 1/2
5/8	.59	5.52	.10	11.5	.13 1/2	12.6	.16	13.8	.19	16	.20 1/2
1/2	.48	4.49	.08 1/4	9.4	.11 1/2	10.3	.13 3/4	11.3	.16 1/4	13	.17
3/8	.38	3.57	.06 1/2	7.5	.09	8.2	.10 1/2	9	.12 1/2	10.3	.13 1/2
5/16	.29	2.76	.05 1/2	5.8	.07	6.3	.08 1/2	6.9	.10 1/2	7.9	.11 1/2
3/16	.21	2.05	.04 1/2	4.3	.05 3/4	4.7	.06 3/4	5.15	.08	5.9	.08 3/4
1/8	.15	1.43	.03 3/4	3.1	.04 1/2	3.35	.05 1/2	3.65	.06 1/2	4.2	.08 1/4
5/32	.12	1.17	.03 1/4	2.52	.04 1/4	2.72	.05 1/4	2.95	.06 1/4	3.4	.07 1/2
1/4	.094			2	.04	2.15	.05	2.35	.06	2.7	.07
Hoisting Rope—6 Strands, 19 Wires to Strand, 1 Hemp Core											
2 3/4	12.1	95	\$1.70	212	\$2.10	234	\$2.55	256	\$3.00	294	\$3.45
2 1/2	10	79.1	1.40	176	1.75	195	2.10	214	2.50	246	2.80
2 1/4	8.1	64.8	1.17	144	1.44	160	1.70	176	2.00	202	2.50
2 3/8	7.22			128	1.30	143	1.52	157	1.79	181	2.15
2	6.4	51.8	.95	114	1.16	127	1.34	140	1.58	161	1.85
1 7/8	5.63	45.8	.88	100	1.02	112	1.25	123	1.46	142	1.75
1 3/4	4.9	40.1	.80	88	.90	98	1.10	108	1.30	124	1.60
1 5/8	4.23	34.8	.65	76	.77	85	.94	94	1.08	108	1.30
1 1/2	3.6	29.7	.57	65	.66	72.5	.80	80.5	.93	92.5	1.10
1 3/8	3.03	25.2	.49	55	.56	61.5	.68	68	.79	78.5	.90
1 1/4	2.5	21	.40	46	.46	51	.56	56.5	.65	65	.75
1 3/8	2.03	17.2	.33	37	.38	41.5	.46	46	.54	53	.62
1	1.6	13.7	.26	29.5	.31	33	.37	36.5	.43	42	.50
7/8	1.23	10.6	.21	22.8	.25	25.4	.29	28	.34 1/2	32.2	.39
3/4	.9	7.86	.17	16.8	.20 1/2	18.7	.24	20.6	.28	23.7	.31
5/8	.63	5.52	.13 1/2	11.8	.15 3/4	13.1	.18	14.4	.21	16.6	.22 1/2
1/2	.51	4.49	.11 1/2	9.6	.13 3/4	10.6	.15 3/4	11.7	.18 1/4	13.5	.19
3/8	.4	3.57	.09 1/2	7.7	.12	8.5	.13 3/4	9.4	.16	10.8	.17
5/16	.31	2.76	.08 1/2	6	.10 1/2	6.6	.12	7.3	.14	8.4	.15 1/2
3/16	.23	2.05	.07 1/2	4.5	.09 1/2	5	.11	5.5	.13	6.3	.14 1/2
1/8	.16	1.43	.06 3/4	3.2	.09 1/4	3.5	.10 3/4	3.9	.12 1/4	4.5	.13 1/2
1/4	.1	.97	.06 1/2	2.1	.09	2.3	.10 1/2	2.5	.12	2.9	.13
Extra Flexible Hoisting Rope—8 Strands, 19 Wires to Strand, 1 Hemp Core											
1 1/2	3.26			57.5	\$0.73	63.3	\$0.88	69	\$1.06	79.5	\$1.19
1 3/8	2.74			48.6	.62	53.4	.75	58.3	.90	67	.98
1 1/4	2.27			40.4	.51	44.4	.62	48.4	.75	55.7	.82
1 3/8	1.84			32.8	.42	36	.51	39.4	.62	45.2	.68
1	1.45	12.2	\$0.29	26	.34	28.6	.41	31.2	.50	35.8	.55
7/8	1.11	9.4	.23	20	.28	22	.34	24	.41	27.6	.43
3/4	.82	6.95	.19 1/2	14.8	.23	16.3	.27 1/4	17.8	.32 1/2	20.5	.34
5/8	.57	4.86	.15 1/2	10.4	.17 1/2	11.4	.20 1/2	12.5	.24	14.4	.25
1/2	.46	4.06	.13	8.5	.15 1/2	9.4	.18	10.3	.21	11.8	.22
3/8	.36	3.28	.11	6.8	.13 1/2	7.5	.15 1/2	8.2	.18 1/4	9.5	.19
5/16	.27	2.40	.09 1/2	5.3	.12	5.8	.14 1/4	6.3	.17	7.3	.17 1/2
3/16	.2	1.60	.08 1/2	3.94	.10 1/2	4.33	.12 1/2	4.7	.15	5.45	.16 1/2
1/8	.13	1.10	.074	2.79	.10 1/4	3.07	.12 1/4	3.34	.14 1/2	3.85	.16
1/4	.09	.80	.07	1.79	.10	1.97	.12	2.15	.14 1/4	2.47	.15 3/4
Special Flexible Hoisting Rope—6 Strands, 37 Wires to Strand, 1 Hemp Core											
3 1/2	19			323	\$3.75	357	\$4.60	392	\$5.35	451	\$6.10
3 1/4	16.37			281	3.25	311	3.95	341	4.65	392	5.25
3	13.95			241	2.75	267	3.35	293	3.95	337	4.50
2 3/4	11.72			204	2.30	226	2.80	248	3.30	285	3.75
2 1/2	9.69			170	1.92	188	2.35	206	2.75	237	3.15
2 1/4	7.85			139	1.60	153	1.90	168	2.20	194	2.75
2 3/8	7			125	1.48	138	1.70	151	2.00	174	2.40
2	6.2			111	1.35	123	1.55	135	1.80	155	2.10
1 7/8	5.45			98	1.20	108.5	1.40	119	1.65	137	1.90
1 3/4	4.75			86	1.05	95	1.28	104	1.50	119.5	1.75
1 1/2	4.09			74.3	.89	82	1.07	89.8	1.25	103.3	1.45
1 3/8	3.49			63.5	.79	70	.95	76.7	1.15	88.2	1.25
1 1/4	2.93			53.5	.65	59	.78	64.6	.93	74.3	1.05
1 3/8	2.42			44.3	.55	48.9	.65	53.5	.78	61.5	.86
1 1/4	1.96			36	.46	39.7	.55	43.5	.66	49.9	.75
1	1.55			28.6	.37	31.5	.44	34.4	.52 1/2	39.5	.59
7/8	1.19			22	.30	24.2	.36	26.5	.43	30.5	.46
3/4	.87			16.4	.24	18.1	.28 1/2	19.8	.34	22.8	.36
5/8	.61			11.6	.18 1/2	12.8	.21 1/2	14	.25	16.1	.27
1/2	.49			9.5	.16 1/2	10.5	.19 1/4	11.5	.22 1/2	13.2	.23
3/8	.39			7.7	.14	8.4	.16 1/4	9.2	.19	10.6	.20
5/16	.3			6	.12 1/2	6.6	.15	7.2	.17 3/4	8.3	.18 1/2
3/16	.22			4.4	.12	4.9	.14 1/4	5.3	.17	6.1	.17 1/2
1/8	.15			3.1	.11 1/2	3.4	.13 3/4	3.8	.16 1/2	4.4	.17
1/4	.10			2	.11	2.2	.13 1/2	2.4	.16	2.8	.16

Tiller or Hand Rope

Used principally for signal pull purposes in mines and factories, and in connection with the operating or controlling device on passenger and freight elevators. Also used to limited extent for steering lines on yachts and motor boats. (See Fig. 9 for 6x42, with 7 hemp cores.)



Fig. 9

Non-spinning Hoisting Rope

This type of rope is so constructed that it prevents the rotating of a free load suspended on the end of a single line. It is recommended for "back haul" or single line derricks.

(Fig. 10 shows 18x7.)

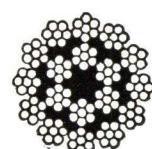


Fig. 10

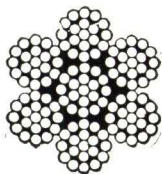


Fig. 11

Galvanized Steel Cables for Suspension Bridges

Cables can be supplied fitted with special bridge or other sockets ready for attaching to anchorage bolts. (Fig. 11 shows 7x19, with wire core.)

Galvanized Yacht Rigging or Guy Rope

Made in 2 constructions: 6 strands, 7 wires to strand, with hemp core, for ship's or yacht's standing rigging and derrick guys; 6 strands, 19 wires to strand, with hemp core, for running rigging and mooring lines. Made in iron and cast steel grades. (Fig. 12 shows Galvanized Iron or Steel Guy Rope, 6x7, 1 hemp core.)

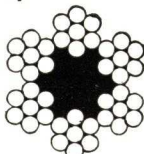


Fig. 12

Galvanized Iron Ship's Rigging or Guy Rope

Fig. 13 shows Galvanized Iron and Cast Steel Running Rope (6x12, 7 hemp cores). Fig. 14 shows Galvanized Steel Hawsers and Mooring Line (6x12 or 24, 7 hemp cores). Fig. 15 shows Galvanized Steel Deep Sea Towing Hawser (6x37, 1 hemp core).

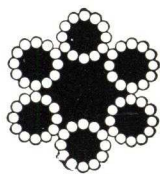


Fig. 13

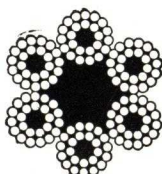


Fig. 14

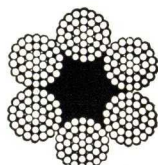


Fig. 15

Tinned or Galvanized High Strength Airplane Strand or Cord

Made to U. S. Government Specifications. (See Fig. 16.) Made in 19 wire—6x7, 7x7, or 7x19 constructions.



Fig. 16

Sash Cord

Made "dead soft" unless ordered to the contrary. Used principally for window weights, bell cords, automobile brakes and whistles. The $\frac{3}{8}$ -in. diameter galvanized sash cord is used on electric open car curtain fixtures; $\frac{1}{8}$ -in. galvanized sash cord is used on car curtain fixtures. (Fig. 17 shows 6x7, with 1 cotton core.)



Fig. 17



Fig. 18

Galvanized Mast Arm or Arc Light Rope

More durable than manila rope and does not shrink. (See Fig. 18.)

Stone Sawing Strand

Suitable for sawing blocks of sandstone or similar stone. (Fig. 19 shows 3 wires twisted together.)



Fig. 19

Perfected Steel Strand

Used for guying smokestacks, telephone, telegraph and overhead transmission line poles; for supporting telephone, signal and transmission cables in overhead work and trolley wire in catenary construction; also as a ground wire in protecting transmission lines from lightning. (Fig. 20 shows Standard Galvanized or Extra Galvanized, 7 steel wires twisted into a single strand.)



Fig. 20

Extra Galvanized Special Strands—Three special grades which meet all requirements for durability, strength, toughness and light weight; Siemens-Martin strand, High Strength (cast steel) strand, and Extra High Strength (plow steel) strand. All three grades are composed of 7 wires each, and have very heavy coating of galvanizing, insuring long life. Besides these three standard grades, we are in position to make strands to most exacting specifications.

Catenary Method of Supporting Trolley Wire—These three special grades of extra galvanized special strands are also used in the catenary method of supporting trolley wire.

Long Spans in High Tension Current Transmission Line—Where necessary to cross over rivers, lakes and bays with power transmission lines, the current may be conducted through an extra galvanized strand of one of the three special grades of steel previously described. An entire power transmission line of very high potential could be economically constructed with extra galvanized Siemens-Martin strand, reducing the number of supporting towers which are often the cause of energy loss and trouble.

Aerial Tramways

We manufacture the Bleichert aerial tramway. Estimates furnished upon request. Refer your transportation problems to us.



Tramway Used in Building Coolidge Dam

Locked Coil Track Cable and Round Wire Track Strand for Aerial Tramways and Cableways

There have been devised these two special cables which present fairly smooth surfaces for wheels to run upon. The better is the locked coil type, which is superior in durability to any other construction. (Fig. 21 shows Locked Coil Track Cable for Aerial Tramways, and Fig. 22 shows Round Wire Track Cable for Aerial Tramways.)

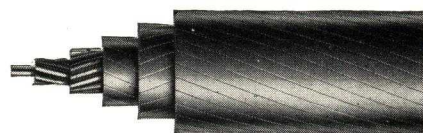


Fig. 21



Fig. 22

91 Wires

Miscellaneous

The AMERICAN STEEL & WIRE COMPANY handle a complete line of wire rope fittings including all types of Thimbles, Tiger Wire Rope Clips, Tiger Wire Rope Hooks, Shackles, Open and Closed Types of Tiger Sockets and Bridge Sockets, Wire Rope Blocks, Turnbuckles, and special fittings for all purposes. They make all types of industrial slings, using Monitor—Silver Strand—Steel Wire Ropes.

The AMERICAN STEEL & WIRE COMPANY manufacture Excel-lay-Preformed Wire Ropes, Flat Ropes, Marlin Clad Ropes, Steel Clay Ropes, as well as other types of special ropes not shown.

JOHN A. ROEBLING'S SONS COMPANY

Wire Rope and Wire; Wire Rope Slings and Fittings

MAIN OFFICE
TRENTON, N. J.

WORKS
TRENTON, N. J.
ROEBLING, N. J.

BRANCH OFFICES

PHILADELPHIA, PA., 223-27 Arch Street

ATLANTA, GA., 934 Avon Avenue

CLEVELAND, OHIO, 701 St. Clair Avenue, N. E.

CHICAGO, ILL., 205 West Wacker Drive; Warehouse: 3952 South Lincoln Street

JOHN A. ROEBLING'S SONS COMPANY OF NEW YORK

NEW YORK, N. Y., 83 Liberty Street

BOSTON, MASS., 51 Sleeper Street

WAREHOUSES: 169-75 Hudson Street, NEW YORK, N. Y.

JOHN A. ROEBLING'S SONS COMPANY OF CALIFORNIA

SAN FRANCISCO, CALIF., 624-46 Folsom Street
LOS ANGELES, CALIF., 216 South Alameda Street

SEATTLE, WASH., 900 First Avenue, South
PORTLAND, ORE., Fourteenth and Marshall Streets

PRODUCTS

WIRE ROPE and CABLES.

SUSPENSION BRIDGES.

WIRE ROPE SLINGS.

WIRE ROPE FITTINGS.

SHOVEL and DREDGE ROPES.

ELEVATOR ROPES and CABLES.

AERIAL CABLES and CONVEYORS.

CABLEWAYS and TRAMWAYS.

STRAND.

WELDING WIRE and CABLES.

FLAT WIRE, SPRING WIRE, TIRE WIRE.

COPPER and BRONZE TROLLEY WIRE.

AIRCRAFT CORD and FITTINGS.

ELECTRICAL WIRES and CABLES.

ARMATURE BINDING WIRE.

For Electrical Wires and Cables, Welding Wire and Electrodes, see Manufacturers' Index

ROEBLING WIRE ROPE AND CABLE

Wire rope is made in five grades: *Iron*, low in strength, soft and withstands little abrasion but is pliable and tough; *Cast Steel*, twice the strength of iron, suitable for moderate duty; *Extra Strong Cast Steel*, combines strength, ductility and toughness; *Plow Steel*, high

strength and capable of resisting heavy abrasion; "*Blue Center*" *Steel*, a superior grade of extra high strength rope, made from a superior grade of steel, in our own furnaces, for use where abrasion is severe and rope is subject to heavy shock, vibration or fatigue.

STANDARD HOISTING ROPE

Standard Hoisting Rope is made of 6 strands, of 19 wires, each laid around a hemp center.

The wires in Standard Hoisting Rope are made from Iron, Cast Steel, Extra Strong Cast Steel, Plow Steel and "Blue Center" Steel, as described.

"Blue Center" Steel—

A superior grade of extra high strength rope recommended where the abrasion is severe and the rope is subject to severe shock, vibration or fatigue. This rope is made from a superior grade of steel. The treatment and drawing is such as to produce a wire that excels all other for strength, toughness and uniformity.

"Blue Center" Steel Wire Rope is the highest developed product of many years' experience in the making of steel and the art of wire rope fabrication.

"Blue Center" Steel Wire Rope is particularly adapted for severe mine duty, for logging lines, scraper, dredge and wrecking ropes, heavy cranes, ballast unloader ropes, excavating machinery, etc.

Plow Steel—Plow Steel Wire Rope has a high strength and unusual toughness and is capable of resisting heavy abrasion.

This rope can be used in place of Cast Steel where it is desirable to increase the strength of a rope without a corresponding increase in rope diameter.

Plow Steel Wire Rope is suited for the average hoisting conditions where the loads are not excessive, the sheaves of normal diameter and the abrasion not too severe.

It has a general use on derricks, mine and coal hoists, cableways, cranes, conveyors, for logging ropes, etc.



Standard Hoisting Rope
6 strands of 19 wires each and a hemp center

Extra Strong Cast Steel—

Extra Strong Cast Steel Wire Rope occupies an intermediate place between Cast Steel and Plow Steel. It is substituted for Cast Steel where it is desirable to slightly increase the factor of safety of a rope of a given diameter.

A careful selection of wire for this grade of rope insures a very satisfactory combination of strength, ductility and toughness.

Cast Steel—While Cast Steel does not have the strength of Extra Strong Cast Steel, and lacks the resistance to abrasion of Plow or "Blue Center" Steel, conditions often exist where for a given diameter of wire rope the stress is not excessive for Cast Steel and its wearing qualities are amply sufficient.

It is suitable for what is termed moderate duty—as for example: freight elevators where the operating tension is relatively low; as the track cables on short span cableways; as the hoist rope on slow speed shallow mine installations that are equipped with large drums and sheaves, or as a haulage rope under favorable operating conditions.

If the duty is heavy, the stronger and tougher grades of steel are recommended.

Iron—Iron Wire Rope is low in strength and as compared to steel rope is soft and will withstand little abrasion. It is pliable and tough, but its field is limited to those uses where the wear is slight and the drums and sheaves are large.

It is recommended for use on drum type of passenger elevators or for transmission of power by wire rope. It is not adapted to general hoisting.

EXTRA PLIABLE HOISTING ROPE

This rope composed of 8 strands of 19 wires each laid around a hemp center, can be used to advantage where conditions are such that sheaves of small diameter must be employed and the abrasion is slight.

The metallic area of an 8 strand rope is not so great as that of a 6 strand rope, but under severe bending conditions the decrease in strength is largely offset by the greater pliability when operated with specified loads and sheave diameters.

"Blue Center" Steel—"Blue Center" Steel Wire Rope in this construction is designed for exceptionally hard service and is recommended where the loads are heavy and the sheaves are small.

The wires are made from a superior grade of steel and every detail of the wire drawing is conducted with the greatest care to insure uniformity, extra high strength, toughness and durability.

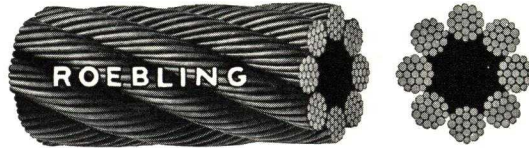
Plow Steel—Plow Steel Wire Rope composed of 8 strands of 19 wires each laid around a hemp center,

is recommended for the average small sheave equipment where the loads are not excessive and the abrasion not severe. It is used for moderate duty crane service, for coal handling machinery and other similar purposes where it is important to have a rope of high strength and extra pliability.

Extra Strong Cast Steel—Extra Strong Cast Steel Wire Rope of this construction is somewhat stronger than the Cast Steel and, therefore, has a greater usefulness than Cast Steel.

It is recommended, however, that in this construction for general use the selection be either the Plow or "Blue Center" Steel grades, these having greater strength.

Cast Steel—The application of Cast Steel quality in this construction is quite limited as the combination of wire and construction produces a steel rope of relatively low strength. Unless the factor of safety is ample, Plow or "Blue Center" Steel grades should be used.



Extra Pliable Hoisting Rope
8 strands of 19 wires each and a hemp center

EXTRA FLEXIBLE HOISTING ROPE

This is an extra flexible hoisting rope, constructed of 6 strands of 37 wires each, and may be recommended in place of the standard 6x19 hoisting rope when the sheaves are found too small for the latter, and where the duty is not severe.

The wires in this rope are necessarily much finer than those used in the standard hoisting rope with 19 wires to the strand and consequently not as suitable to withstand severe abrasion.

The metallic area of this construction is equal to that of the 6x19 construction and hence, on equipment where the operating tension is high and bending requirements are severe, this construction, having high strength and maximum pliability, may be used to advantage.

"Blue Center" Steel—"Blue Center" Steel is recommended in this construction when the sheaves are too small for the 6x19 standard hoisting rope and when the highest combination of maximum strength and greatest flexibility is required.

It is desirable to use this rope on extra duty cranes, dredges, excavating machinery and similar small sheave

equipment where the rope is subject to severe shock, vibration or fatigue.

"Blue Center" Steel Wire Rope is the highest developed product of many years' experience in the making of steel and the art of wire rope fabrication.

Plow Steel—This rope is particularly well adapted for use on the average small sheave equipment where the duty is normal, such as the average crane or derrick. It is a high strength pliable rope that will

give maximum service where the loads are not excessive and the abrasion is moderate.

Extra Strong Cast Steel—Extra Strong Cast Steel in this construction, although somewhat stronger than Cast Steel, is not recommended except in special cases.

Cast Steel—The class of equipment requiring the use of the 6x37 construction rope is generally so designed as to require maximum strength for a given diameter of rope and due to this fact the application of the Cast Steel quality is very limited.



Extra Flexible Hoisting Rope
6 strands of 37 wires each and a hemp center

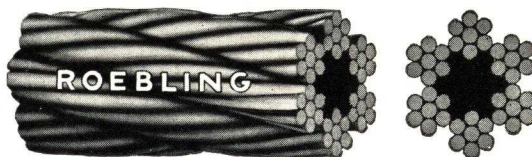
STANDARD COARSE LAID ROPE

Coarse laid rope, for haulage and transmission, constructed of 6 strands of 7 wires each, is much stiffer than standard hoisting rope and requires larger sheaves. On account of the smaller number of wires, this rope should be used with a higher factor of safety, as the breaking of wires will cause a larger reduction in rope strength than will the breaking of the same number of wires in a more flexible construction.

The wires used are considerably larger in diameter than in hoisting rope, and consequently will stand greater wear.

Iron rope of this construction is recommended for power transmissions equipped with large sheaves.

It is made in Iron, Cast Steel, Extra Strong Cast Steel, Plow Steel, and "Blue Center" Steel.



Standard Coarse Laid Rope
6 strands of 7 wires each and a hemp center

SUSPENSION BRIDGE CABLE

We also manufacture Galvanized Suspension Bridge Strand.

This is supplied in sizes 1 to 1½ in. diameter, inclusive, which, in connection with a special design of Anchorage Fitting, permits the construction of a mul-

tipple strand main cable of any desired ultimate strength up to 12,000 tons.

Information as to Strand Specifications will be furnished upon receipt of complete Bridge Specifications or requirements.

FINISH OF WIRES

Wire that receives no finish, other than the polish given in drawing, is termed bright wire.

Wire run through melted zinc spelter is termed galvanized.

Ropes are called bright or galvanized as they are made from bright or galvanized wire.

Ropes used for guys, stays for masts, and as hawsers are furnished galvanized. Ropes which are to be wound under loads around drums and run over sheaves are seldom galvanized, because the galvanizing will soon crack at the bends and there is no advantage derived from the extra cost of galvanizing.

PROPER WORKING LOADS FOR WIRE ROPE

It is never advisable for the working load of a wire rope for general purposes, particularly running ropes, to exceed one-fifth of the breaking strength. This means that the factor of safety should be not less than five. To determine proper working load, divide the breaking strength by the proper factor of safety; e.g., a 1 in. diam. 6x19 "Blue Center" Steel Rope has a breaking strength of 42 tons and with a factor of safety of five, the proper working load would be not over 8.4 tons.

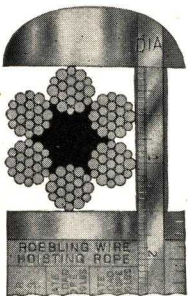
Factors of safety in excess of five, varying up to eight and even more, are often required for safe and economical operation. The proper factor of safety for a

wire rope should be determined by careful and thorough consideration of all pertinent data. Such data should include all loads, acceleration, deceleration, rope speed, rope attachments, the number, size and arrangement of all sheaves and drums, existing conditions causing corrosion and abrasion, length of rope in service, economical rope life and the degree of danger to life and property.

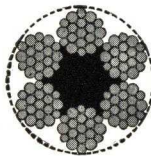
No fixed arbitrary values for factor of safety can be properly set for various classifications of service. These can safely vary within limits, with the conditions present on individual installations and should any doubt arise, we suggest that you consult us.

MEASURING WIRE ROPE

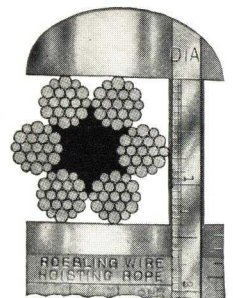
We understand the diameter of a wire rope to be that of a circle enclosing the rope. Care should be taken in measuring to obtain this diameter. If a rope is measured the wrong way and a sheave or pulley is ordered grooved to take the rope, the groove would be too small.



Right Method of
Measuring Wire
Rope



The Diameter of a Wire Rope
Is That of a True Circle



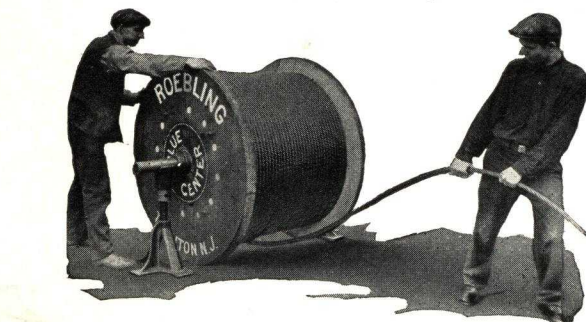
Wrong Method of
Measuring Wire
Rope

HOW TO ORDER WIRE ROPE

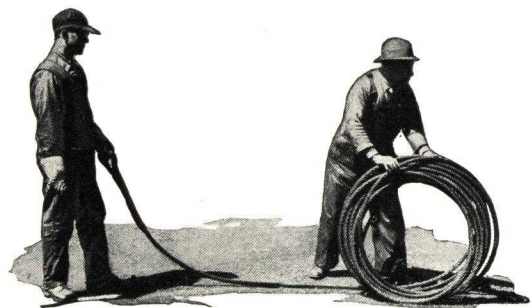
Be sure that the order specifies the exact length and diameter of the rope, the grade of material, the construction, whether bright or galvanized, and also whether it should have a hemp or a wire rope center. If doubt exists on any of these details, consultation with our Wire Rope Engineering Department will enable us to supply the grade of rope that will provide you with the maxi-

mum service for the particular conditions of operation.

Should it be a rush order where consultation would involve too much delay, specify the length, the diameter, the class of service and the maximum load applied to the rope. We will then be in a position to furnish the correct grade and construction, insuring the user economical service.



Pull the rope off in the same way it was put on the reel. Mount the reel so that it will revolve and run the rope off slowly straight ahead. In this way any twists or corkscrew effects will be avoided.



Run coil along the ground and the rope will be straight as it was before being coiled for shipment. There will be no corkscrew effect if this is done.

The Right Way to Unreel or Uncoil Wire Rope

COMPARATIVE BREAKING STRENGTHS OF WIRE ROPE PER GIVEN DIAMETER IN TONS OF 2000 LBS.

Roebling Standard Hoisting Rope (6x19)

Diameter.....in.	2¾	2½	2¼	2⅓	2	1⅞	1¾	1⅝	1½	1⅜	1¼	1⅓	1	¾	⅝	⅜	⅞	½	⅙	⅓	⅕	¼
"Blue Center" steel, approx. strength.....	294.	246.	202.	181.	161.	142.	124.	108.	92.5	78.5	65.	53.	42.	32.2	23.7	16.6	13.5	10.8	8.4	6.3	4.5	2.9
Plow steel, approx. strength.....	256.	214.	176.	157.	140.	123.	108.	94.	80.5	68.	56.5	46.	36.5	28.	20.6	14.4	11.7	9.4	7.3	5.5	3.9	2.5
Extra strong cast steel, approx. strength.....	234.	195.	160.	143.	127.	112.	98.	85.	72.5	61.5	51.	41.5	33.	25.4	18.7	13.1	10.6	8.5	6.6	5.	3.5	2.3
Cast steel, approx. strength.....	212.	176.	144.	128.	114.	100.	88.	76.	65.	55.	46.	37.	29.5	22.8	16.8	11.8	9.6	7.7	6.	4.5	3.2	2.1
Iron, approx. strength.....	95.	79.1	64.8	.....	51.8	45.8	40.1	34.8	29.7	25.2	21.	17.2	13.7	10.6	7.86	5.52	4.49	3.57	2.76	2.05	1.43	.97
Approx. wt. per ft.....lbs.	12.10	10.	8.10	7.23	6.40	5.63	4.90	4.23	3.60	3.03	2.50	2.03	1.60	1.23	.90	.63	.51	.40	.31	.23	.16	.10



Roebling Hoisting Rope (6x19)

Roebling Extra Pliable Hoisting Rope (8x19)

Diameter.....in.	1½	1⅝	1¾	1⅞	2	2⅓	2½	2¾	3	3½	4	4½	5	5½	6	6½	7	7½	8	9	10
"Blue Center" steel, approx. strength.....	79.5	67.	55.7	45.2	35.8	27.6	20.5	14.4	11.8	9.5	7.3	5.45	3.85	2.47							
Plow steel, approx. strength.....	69.	58.3	48.4	39.4	31.2	24.	17.8	12.5	10.3	8.2	6.3	4.7	3.34	2.15							
Extra strong cast steel, approx. strength.....	63.3	53.4	44.4	36.	28.6	22.	16.3	11.4	9.4	7.5	5.8	4.33	3.07	1.97							
Cast steel, approx. strength.....	57.5	48.6	40.4	32.8	26.	20.	14.8	10.4	8.5	6.8	5.3	3.94	2.79	1.79							
Approximate weight per foot.....lbs.	3.26	2.74	2.27	1.84	1.45	1.11	.82	.57	.46	.36	.28	.20	.14	.09							



Roebling Hoisting Rope (8x19)

Roebling Extra Pliable Hoisting Rope (6x37)

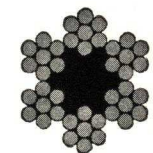
Diam.....in.	3½	3¼	3	2¾	2½	2¼	2⅓	2	1⅞	1¾	1⅝	1½	1⅜	1¼	1⅓	1	¾	⅝	⅜	⅞	½	⅙	⅓	⅕	¼
"Blue Center" steel, approx. strength.....	451	392	337	285	237	194	174	155	137.	119.5	103.3	88.2	74.3	61.5	49.9	39.5	30.5	22.8	16.1	13.2	10.6	8.3	6.1	4.4	2.8
Plow steel, approx. strength.....	392	341	293	248	206	168	151	135	119.	104.	89.8	76.7	64.6	53.5	43.5	34.4	26.5	19.8	14.	11.5	9.2	7.2	5.3	3.8	2.4
Extra strong cast steel, approx. strength.....	357	311	267	226	188	153	138	123	108.5	95.	82.	70.	59.	48.9	39.7	31.5	24.2	18.1	12.8	10.5	8.4	6.4	4.9	3.4	2.2
Cast steel, approx. strength.....	323	281	241	204	170	139	125	111	98.	86.	74.3	63.5	53.5	44.3	36.	28.6	22.	16.4	11.6	9.5	7.7	6.	4.4	3.1	2.0
Approx. weight per ft. lbs.	19.16	16.37	13.95	11.72	9.69	7.85	6.20	5.45	4.75	4.09	3.49	2.93	2.42	1.96	1.55	1.19	.87	.61	.49	.39	.30	.22	.16	.10	



Roebling Hoisting Rope (6x37)

Roebling Standard Coarse Laid Rope (6x7)

Diameter.....in.	1½	1⅝	1¾	1⅞	2	2¼	2½	2⅝	2¾	3	3½	4	4½	5	5½	6	6½	7	7½	8	9	10
"Blue Center" steel, approx. strength	86.5	73.5	61.	50.	40.	30.8	22.8	16.	13.	10.3	7.9	5.9	4.2	3.4	2.70							
Plow steel, approx. strength.....	75.	63.5	53.	43.6	34.8	26.8	19.8	13.8	11.3	9.	6.9	5.15	3.65	2.95	2.35							
Extra strong cast steel, approx. strength.....	68.7	58.2	48.7	40.	31.9	24.6	18.1	12.6	10.3	8.2	6.3	4.7	3.35	2.72	2.15							
Cast steel, approx. strength.....	62.5	53.	44.5	36.4	29.	22.4	16.5	11.5	9.4	7.5	5.8	4.3	3.1	2.52	2.00							
Iron, approx. strength.....	29.7	25.2	21.	17.2	13.7	10.5	7.86	5.52	4.49	3.57	2.76	2.05	1.43	1.17	.....							
Approx. weight per ft.....lbs.	3.38	2.84	2.34	1.90	1.50	1.15	.84	.59	.48	.38	.29	.21	.15	.12	.094							



Roebling Coarse Laid Rope (6x7)

Roebling Galvanized Suspension Bridge Cables (7x7)

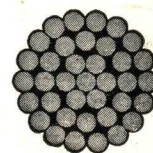
Diameter.....in.	2¾	2½	2¼	2⅓	2¼	2⅓	2	1⅞	1¾	1⅝	1½	1⅜	1¼	1⅓	1	¾	⅝	⅜	⅞	½	⅙	⅓	⅕	¼
Approximate strength.....	310	283	256	232	208	185	164	144	124	106	90	75	62	54	42	28.5	24.4							
Approx. weight per ft. lbs.	12.90	12.10	11.00	9.90	8.91	7.92	7.04	6.19	5.39	4.36	3.72	3.12	2.57	2.09	1.65	1.27	0.96							



Roebling Bridge Cable (7x7)

Roebling Tramway Strand (19 to 55 Wires, According to Diameter of Strand)

Diameter.....in.	1⅝	1½	1⅜	1¼	1⅓	1	¾	⅝	⅜	⅞	½	⅙	⅓	⅕	¼
Plow steel, approximate strength.....	146	127.5	105.	84.6	70.7	58.	44.4	32.5	22.3	18.	15.3				
Cast steel, approximate strength.....	124	108.4	88.8	71.8	60.	49.2	37.6	27.6	19.2	15.	12.6				
Approximate weight per 100 ft.....lbs.	536	455	379	310	258	198	155	112	79	63	49				
Maximum length strand without brazed wires.....	1600	1100	1350	1700	2000	1300	1700	2300	3300	4000	5000				



Roebling Tramway Strand (19 to 55)

GALVANIZED STEEL STRAND

Galvanized Strand is usually composed of seven or nineteen wires, but sometimes of thirty-seven or sixty-one. The wires may have a strength anywhere from 50,000 lb. to 250,000 lb. per square inch. The purpose for which the strand is intended determines its strength. It is always a good investment to buy double galvanized wire, owing to its longer life.

The breaking strength of a galvanized strand is about 90% of the sum of the breaking strengths of the individual wires. The breaking strength of the indi-



Galvanized Common Steel 7-wire Strand

vidual wires depends upon material and drawing. As a general rule the smaller the wire the higher the breaking strength per square inch of metal. Therefore, the smaller sizes of galvanized strand have a breaking strength higher in proportion than the larger sizes. Any statement as to the breaking strength of a class of galvanized strands must be approximate, owing to this diversity of results found among the different sizes.

Galvanized strands have many uses, among which are the following:

For guying smoke stacks,

For carrying telephone cables on a pole line,

For carrying trolley wire in catenary construction,

For protecting transmission lines from lightning

when used as a ground wire,

For long spans in transmission lines.

Special Strength Strands

Siemens-Martin Strand—This strand has a breaking strength of from twenty to thirty times its weight per 1000 ft. It is composed of very soft pliable wire, but of considerably higher strength than the ordinary strand. Owing to these qualities it is largely used for messenger wire to carry telephone cables. For ground wires on high tension transmission lines $\frac{3}{8}$ in. Siemens-Martin Strand is used.

High Strength Strand—The breaking strength of this strand is over thirty times its weight per 1000 ft. It is used where a stronger strand than Siemens-Martin is required. It is consequently stiffer and more difficult to handle. When once in place it is very efficient.

Extra High Strength Strand—The breaking strength of this strand is over fifty times its weight per 1000 ft. What has been said about High Strength Strand is true of this strand, but in a more pronounced degree.



Galvanized Steel 19-wire Strand

PROPERTIES OF GALVANIZED STEEL WIRE STRANDS

Approximate diameter, in.	Approximate weight per 1000 ft., pounds	Breaking strength in pounds			
		Common Soft Strand	Siemens-Martin	High Strength	Extra High Strength
7-wire Strand					
$\frac{5}{8}$	813	11600	19100	29600	42400
$\frac{9}{16}$	671	9600	15700	24500	35000
$\frac{1}{2}$	517	7400	12100	18800	26900
$\frac{7}{16}$	399	5700	9350	14500	20800
$\frac{3}{8}$	273	4250	6950	10800	15400
$\frac{5}{16}$	205	3200	5350	8000	11200
$\frac{9}{32}$	164	2570	4250	6400	8950
$\frac{1}{4}$	121	1900	3150	4750	6650
$\frac{7}{32}$	98.3	1540	2560	3850	5400
$\frac{3}{16}$	72.9	1150	1900	2850	3990
$\frac{5}{32}$	51.3	870	1470	2140	2940
$\frac{1}{8}$	31.8	540	910	1330	1830
19-wire Strand					
1	2073	28700	47000	73200	104500
$\frac{7}{8}$	1581	21900	35900	55800	79700
$\frac{3}{4}$	1155	16000	26200	40800	58300
$\frac{5}{8}$	796	11000	18100	28100	40200
$\frac{9}{16}$	637	9640	16100	24100	33700
$\frac{1}{2}$	504	7620	12700	19100	26700
37-wire Strand					
$1\frac{1}{4}$	3248	44600	73000	113600	162200
$1\frac{1}{8}$	2691	36000	58900	91600	130800
1	2057	28300	46200	71900	102700
61-wire Strand					
$1\frac{3}{4}$	6346	86600	141800	220600	315000
$1\frac{5}{8}$	5497	74600	122100	189900	271300
$1\frac{1}{2}$	4665	63100	103300	160700	229600
$1\frac{3}{8}$	3901	52800	86400	134400	192000

Minimum elongation in 24-in. test piece: Siemens-Martin grade, 8%; high strength grade, 5%; extra high strength grade, 4%.

WIRE ROPE ACCESSORIES AND ATTACHMENTS

Roebing engineers have given the same thought and careful analysis to the requirements of suitable wire rope fittings, that they have given to the unexcelled qualities of their wire rope, and a Roebing fitting is a guarantee that the customer has secured the best.

When a correctly proportioned socket is used, and the attachment is properly made, it will develop the full strength of the wire rope. This connection is recommended for all wire ropes and especially for those operating under severe conditions. The socket must have greater strength than the wire rope to which it is attached, and the fact that the elastic limit of the steel



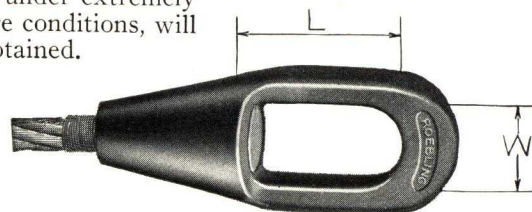
Roebing Open Socket, Drop-forged Steel

For use with Iron, Cast Steel, and Extra Strong Cast Steel ropes; also Plow Steel and "Blue Center" Steel rope in sizes $2\frac{1}{4}$ to $\frac{1}{4}$ ins. Rope circumferences, $7\frac{1}{8}$ to $\frac{3}{4}$ ins.

wire in rope is at least 15% greater than the socket steel, makes it necessary to design sockets on the basis of the elastic properties of the two

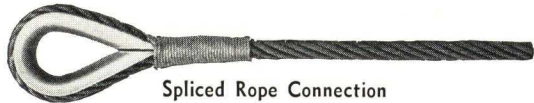
materials. Due to the higher elastic limit of the wire ropes, it will be found that the sockets commonly used are overstressed frequently when wire ropes are subject to extremely high momentary stresses. This, together with the fact that it is common practice to use the same socket on any number of replacement ropes, made it necessary to design sockets in keeping with the extreme requirements of present day rope practice.

The increase of dimensions and weights of sockets together with the use of specially selected steels, forged and machined in our own plant, enable us to offer our sockets with the full assurance that satisfactory service, even under extremely severe conditions, will be obtained.



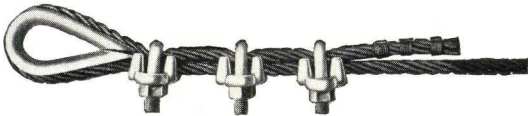
Roebing Closed Socket, Drop-forged Steel

For use with Iron, Cast Steel and Extra Strong Cast Steel ropes; also Plow Steel and "Blue Center" Steel rope in sizes $2\frac{1}{4}$ to $\frac{1}{4}$ ins. Rope circumferences from $7\frac{1}{8}$ to $\frac{3}{4}$ ins.

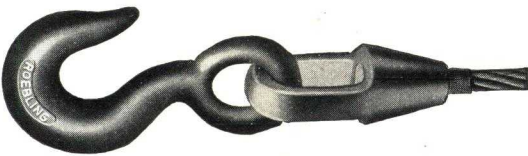
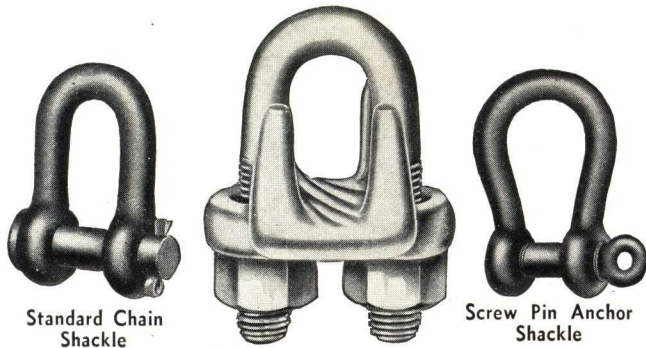


Spliced Rope Connection

The spliced thimble connection, when properly made will not pull out. It will not, however, develop the full strength of the rope, the efficiency varying from 95% to 60%, depending on the rope diameter. For example, the efficiency of a $\frac{1}{2}$ in. rope will be about 95% of the ultimate rope strength, while for a $2\frac{1}{2}$ in. diameter rope, the efficiency will not be over 60% for the spliced thimble connection.



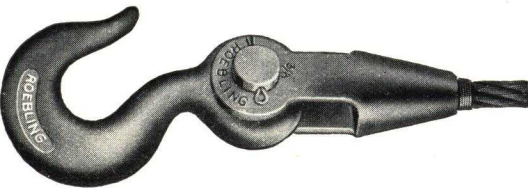
Clip Connection

Roebing Closed Socket and Hook, Drop-forged Steel
Weldless throughout

Standard Chain Shackle

Screw Pin Anchor Shackle

Roebing Galvanized Wire Rope Clip, Drop-forged Steel

Roebing Hook and Open Socket
Both hook and socket of drop-forged steel

Rope diam., in.	Rope circum., in.	For "Blue Center" rope, hook size	For Plow Steel rope, hook size	For Cast Steel rope, hook size
2	6 1/4	...	...	175
1 7/8	5 7/8	...	...	175
1 3/4	5 1/2	175	175	150
1 5/8	5 1/8	175	175	125
1 1/2	4 3/4	150	150	110
1 3/8	4 3/8	125	125	110
1 1/4	3 7/8	110	110	90
1 3/8	3 1/2	90	90	75
1 1/8	3 1/8	75	75	65
1	2 3/4	65	65	50
7/8	2 3/8	50	40	40
3/4	2 3/8	40	30	25
5/8	2	30	25	20
9/16	1 3/4	30	20	15
1/2	1 5/8	20	15	15
7/16	1 3/8	15	15	10
3/8	1 1/8	10	5	5
5/16	1	5	5	5
1/4	3/4	5	5	5

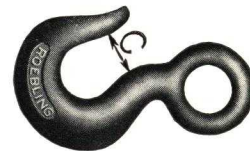


Clip and Clamp Connection

The clip and clamp connection shown is not recommended as a permanent fastening on hoisting ropes. These are, however, easily applied and therefore used extensively but it must be understood that this connection will not develop the ultimate strength of the rope, the maximum efficiency being between 75% and 85% when the correct number of clips is used.

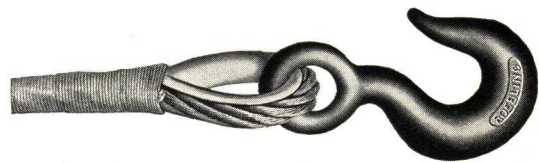


Roebing Extra Heavy Wire Rope Clamp



Roebing Weldless Hook with Eye, Drop-forged Steel

Hook No.	Safe working load, pounds	Inside diam. of eye, inches	Opening "C", inches	Extreme dimensions, in.		Approximate weight, each, pounds
				Length	Width	
175	60000	4 1/2	5	25 1/4	16	129.0
150	45000	4	4 1/2	21 3/4	13 13/16	78.0
125	38000	3 1/2	3 3/4	19 1/4	12	59.0
110	32000	3 1/4	3 3/16	17 1/16	10 3/4	44.0
90	26000	3	3	16 1/16	10	38.0
75	20000	2 3/4	2 3/16	14 1/2	8 9/16	25.0
65	15000	2 1/2	2 1/16	13 3/8	8 1/4	18.5
50	12000	2 1/4	2 1/8	11 3/4	7 1/4	12.0
40	10000	2	1 7/8	10 3/8	6 3/8	8.0
30	7000	1 3/4	1 3/8	8 7/8	5 1/2	5.1
25	5500	1 3/8	1 1/2	7 1/16	5 5/16	3.5
20	4500	1 3/4	1 3/16	6 7/8	4 11/16	2.5
15	3500	1 3/16	1 3/16	6 3/8	4 1/4	2.1
10	2500	1 1/8	1 1/16	6 3/8	4	1.6
5	1800	7/8	1	5 3/8	3 1/8	1.0



Roebing Drop-forged Steel Hook with Thimble

Rope diam., in.	Rope circum., in.	For "Blue Center" rope, hook size	For Plow Steel rope, hook size	For Cast Steel rope, hook size
2	6 1/4	...	175	150
1 7/8	5 7/8	...	175	125
1 3/4	5 1/2	175	175	125
1 5/8	5 1/8	150	150	110
1 1/2	4 3/4	125	110	110
1 3/8	4 3/8	110	110	90
1 1/4	3 7/8	90	90	75
1 3/8	3 1/2	75	75	65
1 1/8	3 1/8	75	65	50
1	2 3/4	65	50	40
7/8	2 3/8	50	40	30
3/4	2 3/8	40	30	25
5/8	2	30	25	20
9/16	1 3/4	30	20	15
1/2	1 5/8	20	15	10
7/16	1 3/8	15	10	10
3/8	1 1/8	10	5	5
5/16	1	5	5	5
1/4	3/4	5	5	5



Roebling Logging Swivel
Hook and Socket, Drop-
forged Steel



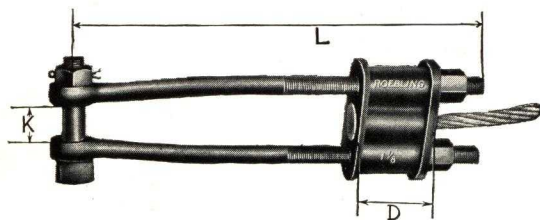
Roebling Swivel Hook and
Socket, Drop-forged Steel



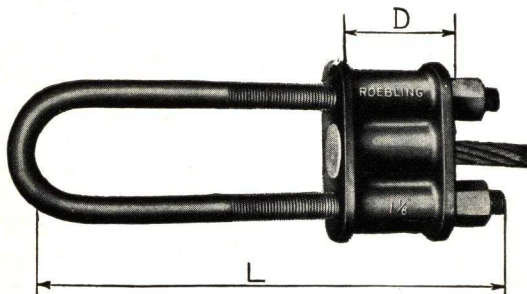
Roebling Safety Snap Eye
Hook, Drop-forged Steel



Roebling Reversed Eye Hook,
Drop-forged Steel



Roebling Open Bridge Sockets

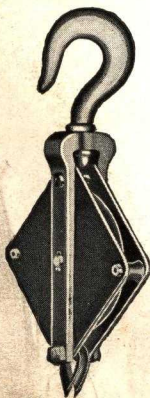


Roebling Closed Bridge Sockets

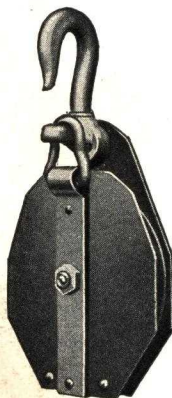
For use with Cast Steel, Plow Steel and "Blue Center" Steel Ropes and Galvanized Bridge Cables

Sheave Blocks

Furnished with self-lubricating graphite-bronze and metaline bushings, or without bushings.



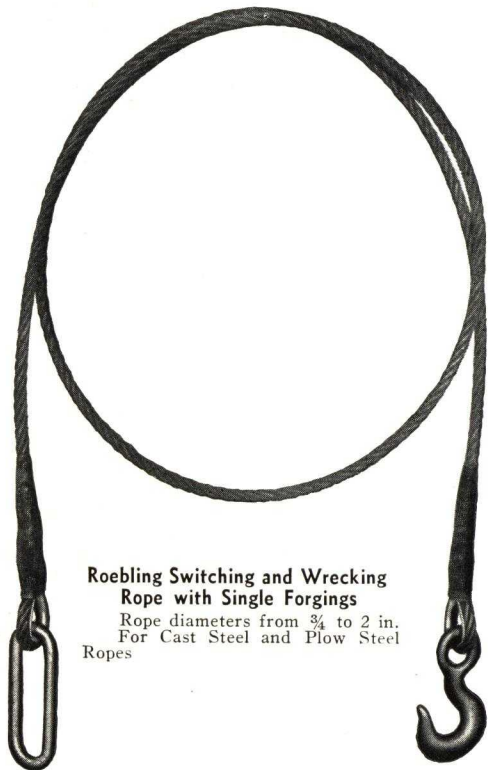
Single Sheave
Block
With stiff swivel
hook



Snatch Block



Double Sheave Block
Supplied with hook or
shackle



Roebling Switching and Wrecking
Rope with Single Forgings
Rope diameters from $\frac{3}{4}$ to 2 in.
For Cast Steel and Plow Steel
Ropes

Roebling Heavy Steel Wire Rope Thimbles



GALVANIZED

For Use with "Blue Center" and Plow Steel Ropes
Reg. U. S. Pat. Off.

Diameter of rope in inches	Circum- ference of rope in inches	Inside opening of thimble, inches		Approx. weight in pounds	List price loose	List price spliced in rope
		Width	Length			
2	6 1/4	6	12	30.00	\$9.50	\$39.50
1 7/8	5 7/8	6	12	30.00	9.50	34.75
1 3/4	5 1/2	4 1/2	9	18.00	6.25	27.75
1 5/8	5 1/4	4	8	11.75	4.50	23.00
1 1/2	4 3/4	3 1/2	6 1/4	7.50	3.25	19.00
1 3/8	4 3/8	3 1/2	6 1/4	7.50	3.25	15.00
1 1/4	3 7/8	2 7/8	5 5/8	4.50	1.55	10.30
1 3/8	3 3/4	2 7/8	5 5/8	4.50	1.55	9.05
1 1/8	3 1/2	2 1/2	4 1/2	2.80	.80	7.20
1	2 3/4	2 1/2	4 1/2	1.60	.65	5.15
7/8	2 1/4	2	3 3/4	1.30	.60	3.20
3/4	2	1 3/4	3 3/4	.75	.50	2.75
7/16	1 3/4	1 3/4	3 3/4	.75	.50	2.30
7/16	1 3/8	1 1/2	2 3/4	.54	.30	2.05
7/16	1 3/8	1 1/4	2 1/2	.30	.20	1.50
5/8	1 1/8	1 1/8	2 1/8	.22	.15	1.40
5/8	1	1	1 7/8	.15	.08	1.30
3/4	3/4	7/8	1 5/8	.12	.08	1.30

For Use with Extra Strong Cast Steel, Cast Steel and Iron Ropes

2	6 1/4	6	12	22.00	\$8.50	\$38.50
1 7/8	5 7/8	6	12	22.00	8.50	33.75
1 3/4	5 1/2	4	8	11.75	4.50	26.00
1 5/8	5 1/4	3 1/4	6	7.50	2.75	21.25
1 1/2	4 3/4	2 3/4	4 3/4	4.75	1.75	17.50
1 3/8	4 3/8	2 3/4	4 3/4	4.75	1.75	13.50
1 1/4	3 7/8	2 1/4	4 1/4	2.75	.95	9.70
1 3/8	3 3/4	2 1/4	4 1/4	2.75	.80	8.30
1	3 1/2	1 13/16	3 3/8	1.60	.65	7.05
7/8	2 3/4	1 3/4	3 1/4	1.25	.60	5.10
3/4	2 1/4	1 5/8	3 1/8	1.00	.50	3.10
7/16	2	1 3/8	2 1/2	.60	.35	2.60
7/16	1 3/4	1 3/8	2 1/2	.60	.35	2.15
7/16	1 3/8	1 1/4	2 1/2	.30	.20	1.95
7/16	1 3/8	1 1/8	2 1/8	.22	.12	1.45
5/8	1 1/8	1	1 7/8	.15	.09	1.35
5/8	1	7/8	1 5/8	.12	.08	1.30
3/4	3/4	7/8	1 5/8	.12	.08	1.30

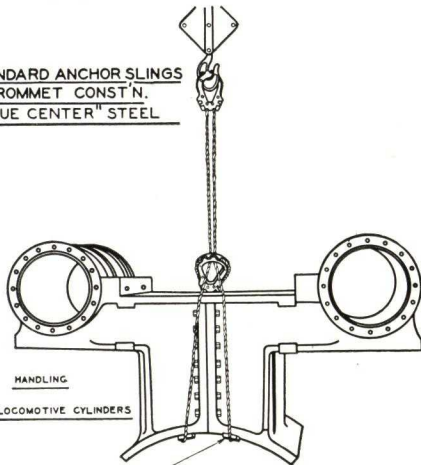
The Thimbles will take a pin $\frac{1}{16}$ in. smaller than inside width given above.

TYPES OF ROEBLING "BLUE CENTER" STEEL WIRE ROPE SLINGS

With Tables of Maximum Safe Loads, etc.

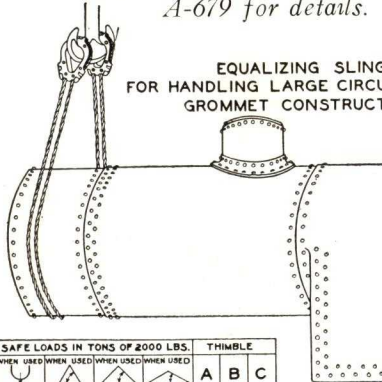
For all practical purposes in and about the industrial shop or in handling of structural steel, Roebling Wire Rope Slings are safe, economical and efficient. They are designed especially for hoisting machine parts, lathes, planer tables, steel plates, ladles, generators, mills, armatures, boilers, pipe, stone blocks, structural steel such as I-beams, girders, columns, etc., automobile parts, and other materials.

Roebling Wire Rope Slings are made from our highest strength steel—"Blue Center"—and are fitted with equalizing thimbles which allow an even distribution of the load when the sling is under tension. These fittings are electric furnace steel castings of great strength and durability. Send for Catalogue A-679 for details.

STANDARD ANCHOR SLINGS
GROMMET CONSTRUCTION
"BLUE CENTER" STEEL

WOOD PADDING ON SHARP CORNERS ADVISABLE

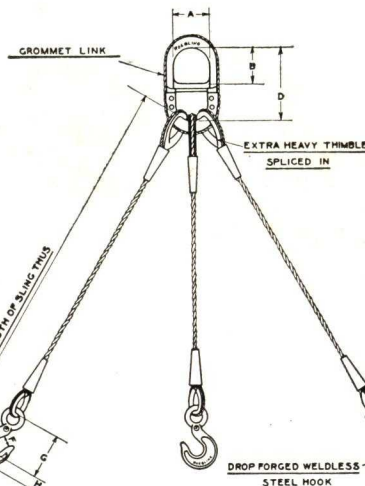
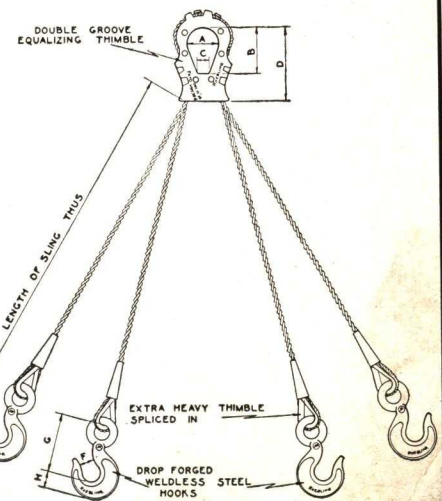
DIA. SLING	SAFE LOADS IN TONS OF 2000 LBS.	THIMBLE
		A B C
1/2	2	3 1/2 5 1/2 1 1/2
3/4	4	3 1/2 5 1/2 1 1/2
1	6	3 1/2 5 1/2 1 1/2
1 1/8	8	5 1/2 8 1 1/2
1 1/4	10.5	5 1/2 8 1 1/2
1 1/2	13	5 1/2 8 1 1/2
1 3/4	15	5 1/2 8 1 1/2
2	17	6 9 1 1/2
2 1/4	20	6 9 1 1/2
2 1/2	22	9 14 2
2 3/4	25	9 14 2

EQUALIZING SLINGS
FOR HANDLING LARGE CIRCULAR BODIES
GROMMET CONSTRUCTION

DIA. SLING	SAFE LOADS IN TONS OF 2000 LBS.			THIMBLE		
	VERTICAL 90° ANGLE	45° ANGLE	30° ANGLE	A	B	C
1/2	14	12	10	7	8	12 1/2
3/4	20	17	14	10	8	12 1/2
1	26	22.5	18	13	8 1/2	13 2 1/2
1 1/8	32	28	23	16	8 1/2	13 2 1/2
1 1/4	38	33	27	19	8 1/2	13 2 1/2
1 1/2	45	39	32	22.5	8 1/2	13 2 1/2
1 3/4	51	44	36	25.5	8 1/2	13 2 1/2
2	57	49	40	28.5	9	14 2
2 1/4	65	56	46	32.5	9 1/2	15 2 1/2
2 1/2	72	62	51	36	10	15 2 1/2
2 3/4	80	69	57	40	10 1/2	15 2 1/2
3	90	78	64	45	10 1/2	15 2 1/2
3 1/2	100	87	71	50	10 1/2	15 2 1/2

TYPE "HA"
EQUALIZING SLINGS WITH HOOK
GROMMET CONSTRUCTION

DIA. SLING	SAFE LOAD IN TONS OF 2,000 LBS.	SIZE OF HOOK	HOOK			EQUALIZING THIMBLE												WGT. OF HOOK & THIMBLE IN LBS.
			F	G	H	SET "M"			SET "L"			SET "SP"			C			
						A	B	C	A	B	C	A	B	C				
$\frac{1}{2}$	2	50	2 $\frac{1}{8}$	8 $\frac{1}{16}$	2 $\frac{1}{2}$	7 $\frac{1}{16}$	3 $\frac{1}{8}$	5 $\frac{1}{16}$	1 $\frac{1}{16}$	5 $\frac{1}{8}$	7 $\frac{1}{16}$	1 $\frac{1}{16}$				22		
$\frac{3}{8}$	4	65	2 $\frac{1}{8}$	9 $\frac{1}{16}$	2 $\frac{1}{2}$	7 $\frac{1}{16}$	3 $\frac{1}{8}$	5 $\frac{1}{16}$	1 $\frac{1}{16}$	5 $\frac{1}{8}$	8 $\frac{1}{16}$	1 $\frac{1}{16}$				36		
$\frac{1}{2}$	6	75	2 $\frac{1}{8}$	10 $\frac{1}{16}$	2 $\frac{1}{2}$	7 $\frac{1}{16}$	3 $\frac{1}{8}$	5 $\frac{1}{16}$	1 $\frac{1}{16}$	5 $\frac{1}{8}$	8 $\frac{1}{16}$	1 $\frac{1}{16}$	8	12	1 $\frac{1}{8}$	42		
$\frac{7}{8}$	8	90	3	11 $\frac{1}{4}$	3	8	5 $\frac{1}{4}$	8	1 $\frac{1}{4}$	6 $\frac{1}{8}$	10 $\frac{1}{4}$	1 $\frac{1}{8}$	8	12	1 $\frac{1}{8}$	60		
1	10.5	125	3 $\frac{1}{2}$	12 $\frac{1}{2}$	3	8	5 $\frac{1}{2}$	8	1 $\frac{1}{2}$	6 $\frac{1}{2}$	10 $\frac{1}{2}$	1 $\frac{1}{2}$	8	13	2 $\frac{1}{2}$	81		
$1 \frac{1}{8}$	13	150	4 $\frac{1}{2}$	15 $\frac{1}{2}$	4	9 $\frac{1}{2}$	5 $\frac{1}{4}$	7 $\frac{3}{4}$	1 $\frac{1}{2}$	7	10 $\frac{3}{4}$	2	8 $\frac{1}{2}$	13	2 $\frac{1}{2}$	117		
$1 \frac{1}{4}$	15	175	5	16 $\frac{1}{2}$	4 $\frac{1}{2}$	9 $\frac{1}{2}$	5 $\frac{1}{2}$	7 $\frac{1}{2}$	1 $\frac{1}{2}$	7	10 $\frac{1}{2}$	2	8 $\frac{1}{2}$	13	2 $\frac{1}{2}$	170		

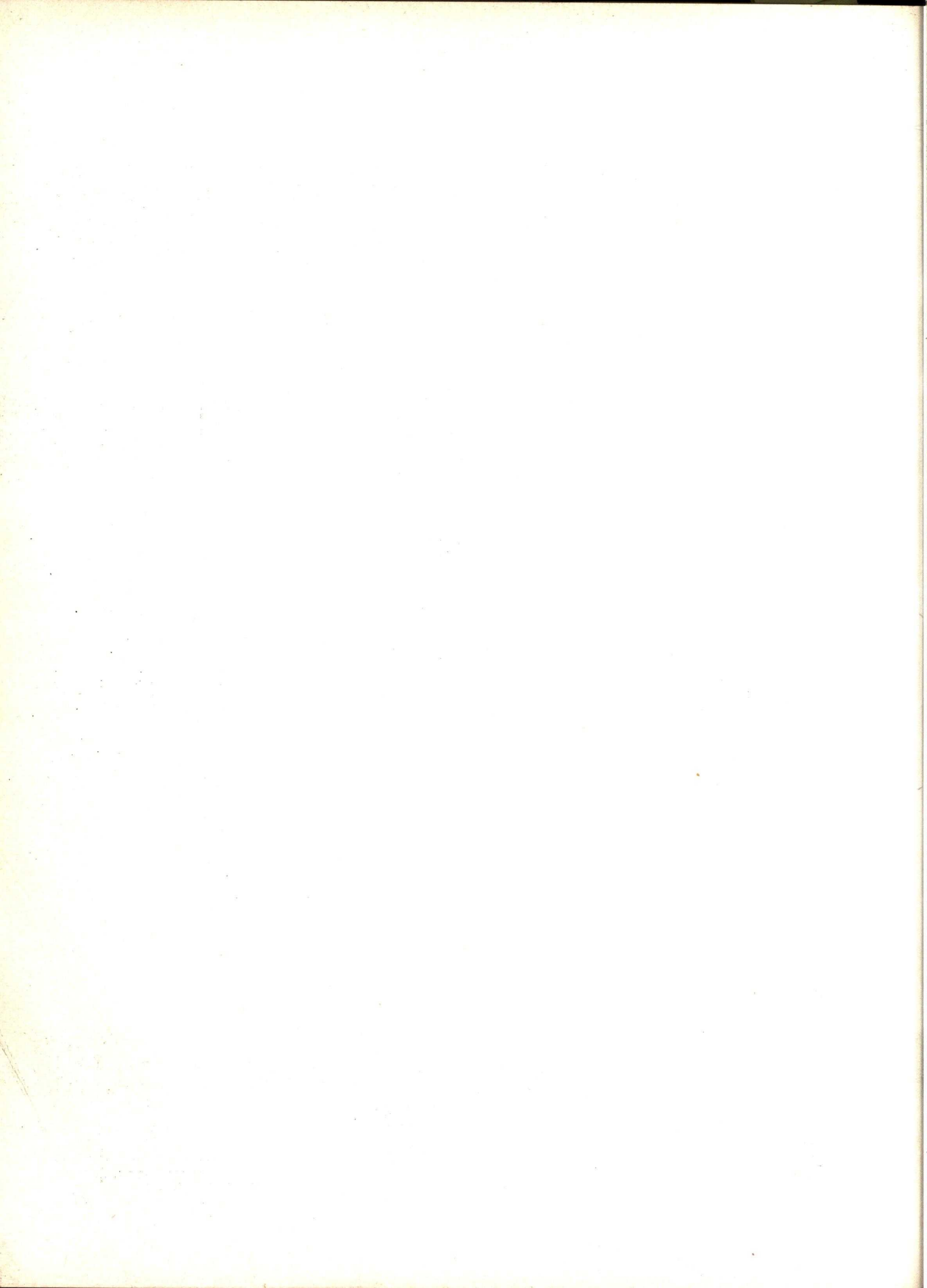
TYPE "GL"
HOOK BRIDLE SLINGS
WITH THREE HOOKSTYPE "DG"
EQUALIZING BRIDLE SLINGS
WITH FOUR HOOKSTYPE "ET"
EQUALIZING BRIDLE SLINGS WITH HOOKS

DIA. SLING	SAFE LOADS		SIZE HOOK	EQUALIZING THIMBLE											
	UNDER ONE END			MOOK											
	VERTICAL	AT ANGLE		F	G	H	A	B	C	D	E	F	G	H	
1/2	3	2.5	25	15	5 1/2	18	4 1/2	7	14	9 1/2	1 1/2				
3/4	4.5	4	30	18	6 1/2	18	5 1/2	7 1/2	17	10 1/2	1 1/2				
1	6.25	5.5	40	18	7 1/2	2	5 1/2	7 1/2	16	10 1/2	1 1/2				
1 1/8	8	8	50	25	8 1/2	2 1/2	6 1/2	8 1/2	2 1/2	14 1/2	2 1/2				
1 1/4	11.5	10	65	25	9 1/2	2 1/2	7 1/2	9 1/2	2 1/2	14 1/2	2 1/2				
1 1/2	14	12	75	25	10 1/2	2 1/2	7 1/2	10 1/2	2 1/2	14 1/2	2 1/2				
1 3/4	17	14.5	90	3	11 1/2	3 1/2	7 1/2	10 1/2	2 1/2	14 1/2	2 1/2				
2	20	17	110	3 1/2	12 1/2	3 1/2	8	12	2 1/2	15 1/2	3				
2 1/4	23	20	125	3 1/2	13 1/2	3 1/2	8	12	2 1/2	15 1/2	3				
2 1/2	25	22	150	4 1/2	14 1/2	4 1/2	9 1/2	14	2 1/2	17 1/2	3 1/2				
2 3/4	29	25	175	5	15 1/2	4 1/2	9 1/2	14	2 1/2	17 1/2	3 1/2				

MAXIMUM SAFE LOADS, ETC.
WHERE ROPE DOES NOT COME IN CONTACT WITH MATERIAL HOISTED

SAFE LOADS IN TONS OF 2000*				LINK			HOOK			
DIA. SLING	SAFE LOADS IN TONS OF 2000*			A	B	C	SIZE OF HOOK	F	G	H
	VERTICAL	45° ANGLE	60° ANGLE							
1 1/2	4.5	3.75	3	2.25	6	6	13	25	1 1/2	5 1/2
3/4	6.75	6	4.75	3.5	6	6	13	30	1 1/2	6 1/2
1	9.5	8	6.75	4.75	6	6	13	40	1 1/2	7 1/2
1 1/8	13.5	12	9.5	6.75	7 1/2	7 1/2	16	50	2 1/2	8 1/2
1 1/4	17	15	12	8.5	7 1/2	7 1/2	16	65	2 1/2	9 1/2
1 1/2	21	18	15	10.5	9	9	20	75	2 1/2	10 1/2
1 3/4	26	22	18	13	9	9	20	90	3	11 1/2
2	30	26	21	15	10	10	23	110	3 1/2	12 1/2
2 1/4	34	30	24	17	10	10	23	125	3 1/2	13 1/2
2 1/2	38	33	27	19	12	12	27	150	4 1/2	15 1/2
2 3/4	43	37	30	21.5	12	12	27	175	5	16 1/2

DIA. SLING	SAFE LOAD IN TONS LIFTED WITH 2 LEGS  	THIMBLE				HOOK				
		A	B	C	D	SIZE HOOK	F	G	H	
$\frac{1}{2}$	5	4.25	5 $\frac{1}{2}$	7 $\frac{1}{2}$	2	11 $\frac{1}{2}$	25	1 $\frac{1}{2}$	5 $\frac{1}{2}$	1 $\frac{1}{2}$
$\frac{3}{4}$	8	6.5	5 $\frac{1}{2}$	7 $\frac{1}{2}$	1 $\frac{1}{2}$	11 $\frac{1}{2}$	30	1 $\frac{1}{2}$	6 $\frac{1}{2}$	1 $\frac{1}{2}$
1	11	9	5 $\frac{1}{2}$	7 $\frac{1}{2}$	1 $\frac{1}{2}$	11 $\frac{1}{2}$	40	1 $\frac{1}{2}$	7 $\frac{1}{2}$	2
$1\frac{1}{8}$	16	12.5	6 $\frac{1}{2}$	8 $\frac{1}{2}$	2 $\frac{1}{2}$	14 $\frac{1}{2}$	50	2 $\frac{1}{2}$	8 $\frac{1}{2}$	2 $\frac{1}{2}$
$1\frac{1}{4}$	20	16	6 $\frac{1}{2}$	8 $\frac{1}{2}$	2 $\frac{1}{2}$	14 $\frac{1}{2}$	65	2 $\frac{1}{2}$	9 $\frac{1}{2}$	2 $\frac{1}{2}$
$1\frac{1}{2}$	24	20	8 $\frac{1}{2}$	10 $\frac{1}{2}$	2 $\frac{1}{2}$	17 $\frac{1}{2}$	75	2 $\frac{1}{2}$	10 $\frac{1}{2}$	2 $\frac{1}{2}$
$1\frac{3}{4}$	29	24	8 $\frac{1}{2}$	10 $\frac{1}{2}$	2 $\frac{1}{2}$	17 $\frac{1}{2}$	90	3	11 $\frac{1}{2}$	3
2	34	28	9	12 $\frac{1}{2}$	3 $\frac{1}{2}$	19	110	3 $\frac{1}{2}$	12 $\frac{1}{2}$	3 $\frac{1}{2}$
$2\frac{1}{4}$	40	32	9	12 $\frac{1}{2}$	3 $\frac{1}{2}$	19	125	3 $\frac{1}{2}$	13 $\frac{1}{2}$	3 $\frac{1}{2}$
$2\frac{1}{2}$	44	35	10	13 $\frac{1}{2}$	4 $\frac{1}{2}$	20 $\frac{1}{2}$	150	4 $\frac{1}{2}$	15 $\frac{1}{2}$	4
$2\frac{3}{4}$	50	41	10	13 $\frac{1}{2}$	4 $\frac{1}{2}$	20 $\frac{1}{2}$	175	5	16 $\frac{1}{2}$	4 $\frac{1}{2}$



SWEET'S ENGINEERING CATALOGUES

SECTION
4

FACTORY EQUIPMENT AND MATERIALS

CONTINUOUS PROCESS EQUIPMENT

• • •

CHEMICAL APPARATUS

• • •

INDUSTRIAL FUELS AND FURNACES

B. MIFFLIN HOOD COMPANY

Acidproof Brick, Tower Packing, and Chemical Stoneware

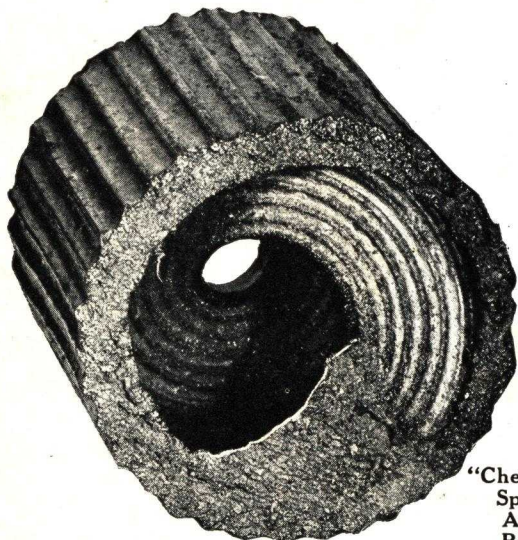
FACTORY AND SALES OFFICE

DAISY, TENN.

(OR—ATLANTA, GA.)

Facilities

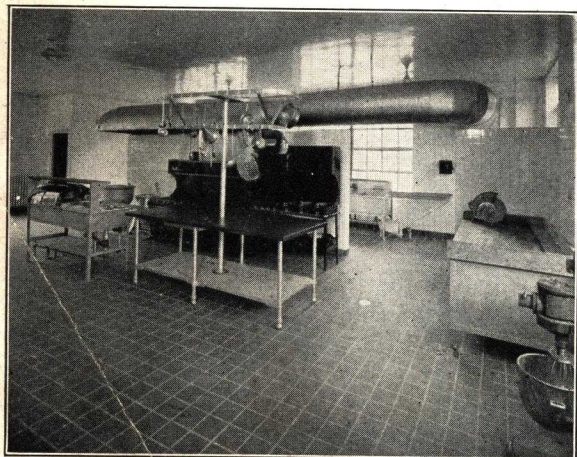
The Hood Company has eight roofing and floor tile plants of gigantic production. Costs have been cut in half. Because of the long life of vitrified floor and roof tile they are economical to industry. Vitrified clay has longer life for tower packing, floors and roofs than any other material known to man.



"Chemico"
Spiral
Acid
Ring

"Chemico" Spiral Packing Ring

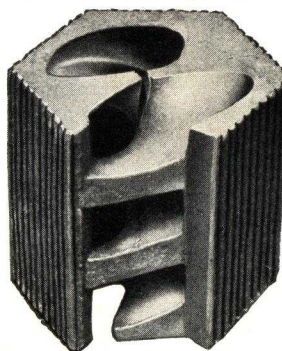
"Chemico" is a mechanically perfect scientifically designed packing ring for absorption, cooling, reaction and condensing towers. It produces a most effective contact surface per unit of reaction space. 50 sq. ft. of contact surface in 1 cu. ft. of packed space. From 25% to 500% increased surface. 55% of packed space is free volume or open for the passage of gas, liquid and dirt, with ample space for any chemical reaction.



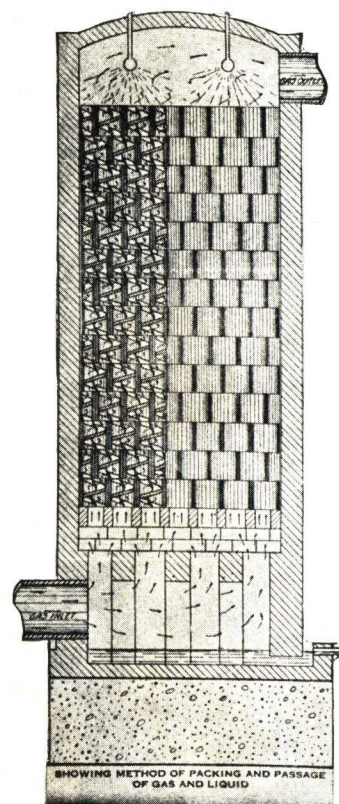
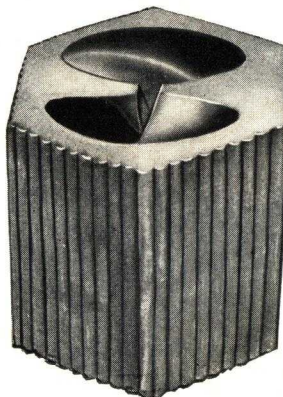
St. Mary's Hospital, Knoxville, Tenn.
CROWE & SCHULTE, Architects

Hood's Vitrified Pavers make ideal floors to resist acids and chemicals.

Hood's "Honeycomb" Double Spiral Acid Ring



Phantom View Showing Helical
Surface of Double Spiral



Hood's 4-in. "Honeycomb" Double Spiral packed mechanically require 28 per cu. ft.—48% of packed volume is free air space. Material is free from soluble impurities, and is not affected by oil, water, acids or alkalis. Rings are completely vitrified and therefore non-absorbent. Will not scale or disintegrate.



Hood's Vitrified Shale Roofing Tile

Hood's Vitrified Shale Roofing Tile is ideal for all types of industrial buildings and especially where the deteriorating fumes of acids and chemicals are present. Cost is surprisingly low, and tile practically everlasting.

MAURICE A. KNIGHT

Manufacturer of Acid Proof Chemical Stoneware

233 Kelly Avenue, AKRON, OHIO

BRANCH OFFICES

NEW YORK, N. Y., Room 1138, 55 W. 42nd Street—Telephone, Chicker-
ing 4-6145

CHICAGO, ILL., Room 402½, 208 No. Wells Street—Telephone, Franklin
2628

NIAGARA FALLS, N. Y., 309 United Office Building—Telephone, Niagara
Falls 507

PHILADELPHIA, PA., 1600 Arch Street—Telephone, Rittenhouse 6300, 6301

CLEVELAND, OHIO, 917 Fidelity Building—Telephone, Main 5145

ST. LOUIS, MO., 3001 North Broadway—Telephone, Tyler 3380

SAN FRANCISCO, CAL., Merchants Exchange Building—Telephone,
Douglas 375

MONTREAL, QUE., 3465 Marlowe Avenue—Telephone, Walnut 5705

LOS ANGELES, CAL., 1015 E. 8th Street—Telephone, Vandike 6403

DETROIT, MICH., 314 Stephenson Building—Telephone, Madison 9243

Products

All ACID PROOF CHEMICAL STONEWARE Equipment for Chemical Manufacturers and for Users of Corrosives:

Acid Proof Brick and Cement, Jars, Blow Cases, Receivers, Tanks, Towers, Tower Packing, Filters, and Kettles.

Laboratory Sinks, Pipe and Pipe Fittings, and Valves.

Also, Special Ware made to order according to your particular requirements.



Deairated—Vacuumized

Guarantee

We make every description of acid proof chemical stoneware, each piece of which is *guaranteed* acid proof and corrosion proof throughout the entire body, and satisfactory in every respect.

It withstands the action of acids (hydrofluoric alone excepted), alkalis (including chlorine), chemicals and all corrosive solutions and gases, weak or strong, hot or cold.

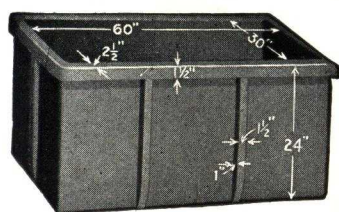


Fig. 232. Acid Proof Tank

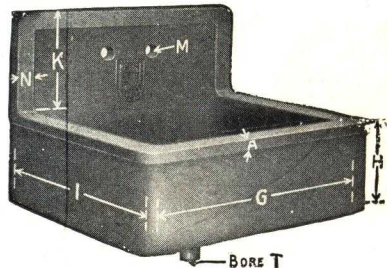


Fig. 237. Acid Proof Laboratory Sink with Back



Fig. 202. Acid Proof Straightside Jar with Outlet

The New Knight-Ware

Deairated (vacuumized) Knight-Ware is a vastly improved quality of Acid Proof Chemical Stoneware. The deairing process incorporated in the scientific preparation of selected clays insures a body texture which is very dense, uniform and wholly vitrified. Wall thicknesses may be materially reduced giving a higher coefficient of heat transfer, greater resistance to thermal shock and greatly reduced weight.

Advantages of Knight-Ware

The fact that Knight-Ware is absolutely proof against the action of all acids (hydrofluoric acid solutions alone excepted), alkalis, chemicals and all corrosive solutions and gases, weak or strong, hot or cold, makes it a very desirable equipment for most any service involving acid or corrosive conditions. It does not in any way depend upon a glaze, enamel or veneer for its acid resisting qualities. It is non-absorbent and non-contaminating. Knight-Ware is furnished in seven distinct body textures, all acid proof and each adapted to meet distinct conditions.

Plant Equipment

We are in a position to furnish complete plants or parts in Knight-Ware Equipment. Not only do we furnish standard designs of towers, tower packings, receivers, tourrills, pipe and fittings, etc., but we also make to order from your prints, any special designs of equipment that you might need. Fully 80% of our entire production is special and fabricated to specifications.

Laboratory Equipment

We furnish one-piece laboratory sinks, pipe and fittings for waste, drain and ventilating lines, sumps or dilution basins, ventilating roof caps, etc., for the equipment of high school, college and university chemical laboratories, hospitals and all such structures having an acid or corrosive waste. Every Knight-Ware Laboratory Sink is custom built, not molded or cast, but fashioned by craftsmen's hands, so that any special feature or idea can be embodied at no greater proportionate cost. Other equipment such as pitchers, tanks, pots, generators, etc., are also supplied.

Organization and Service

MAURICE A. KNIGHT has manufactured acid proof chemical stoneware exclusively for over 26 years. We have acquired a thorough knowledge of our product and its possibilities, and are prepared to furnish any equipment possible and practical to fabricate from clay.



Fig. 290. Acid Proof Threaded Dripless Faucet

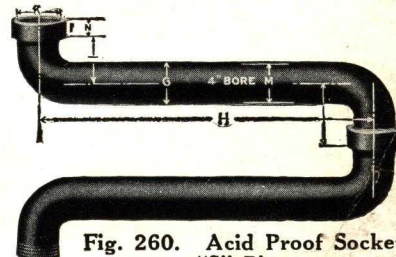


Fig. 260. Acid Proof Socket "S" Pipe

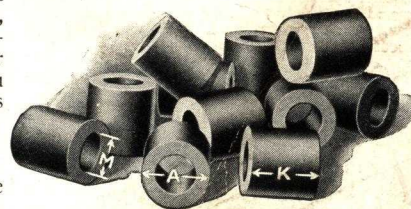


Fig. 134. Small Tube Tower Packing

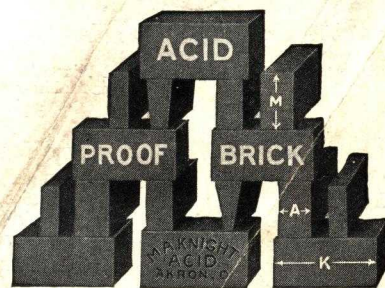


Fig. 135. Acid Proof Brick

MAGNETIC MANUFACTURING CO.

Manufacturers of "Stearns High Duty" Magnetic Equipment Exclusively
612 South Twenty-ninth Street, MILWAUKEE, WIS.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

See Telephone Directory

"Stearns High Duty" Magnetic Separation Equipment

Pulleys, Steel Apron Conveyor Magnets, Magnetic Drums, Spout Magnets, Safety Magnets, Launder Magnets, Suspended Magnets, Laboratory Magnetic Separators in standard or special models to meet requirements.

Industry has found this equipment useful and profitable. It has proved invaluable to iron, steel and brass foundries, smelters, chemical manufacturers and mineral refiners, in fertilizer plants, pulverized coal installations, glass works, graneries, feed mills and for many purification problems.

The success or failure of magnetic separation is invariably reflected in the design. An attractive investment, determined on a price basis soon fades, disclosing high operating costs.

"Stearns High Duty" equipment need no apologies. They are designed by electrical and mechanical engineers who have specialized in the magnetic field exclusively for thirty years. The electrical efficiency of our equipment would be hard to match. The design is so liberal and the workmanship so nearly perfect that this efficiency is maintained throughout the life of the equipment.

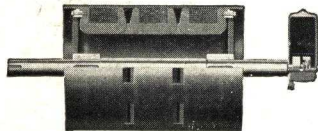


Fig. 209. "Stearns High Duty" Magnetic Pulley

As important today as the conveyor in which it is used. The magnet must remove all iron and steel. There is always sufficient magnetic power in reserve to handle the peak load

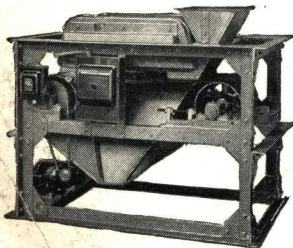


Fig. 294. "Stearns" Type "Q" Separator
Effectively removes free iron from finely ground material. Highly efficient on ceramics, plastics, resinous materials and other process products

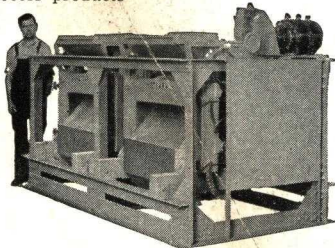


Fig. 295. "Stearns" High Duty Type "K" Induction Separator

For the separation of ores and minerals, particularly materials of low permeability or high magnetic reluctance

Code	Dia., in.	Belt, in.	Cap., cu. ft. hour
1212	12	12	735
1214	12	14	820
1216	12	16	955
1218	12	18	1025
1220	12	20	1230
1224	12	24	1500
1230	12	30	1920
1236	12	36	2320
1242	12	42	2730
1248	12	48	3140
1516	15	16	1465
1518	15	18	1675
1520	15	20	1890
1524	15	24	2310
1530	15	30	2950
1536	15	36	3550
1542	15	42	4200
1548	15	48	4800
1816	18	16	2030
1818	18	18	2310
1820	18	20	2610
1824	18	24	3150
1830	18	30	4040
1836	18	36	4800
1842	18	42	5760
1848	18	48	6650
2018	20	18	2900
2020	20	20	3200
2024	20	24	3990
2030	20	30	5100
2036	20	36	6400
2042	20	42	7230
2048	20	48	8350
2418	24	18	3670
2424	24	24	5040
2430	24	30	6460
2436	24	36	7870
2442	24	42	9180
2448	24	48	10600
2460	24	60	13300
3018	30	18	4700
3024	30	24	6470
3030	30	30	8260
3036	30	36	10000
3042	30	42	11820
3048	30	48	13600
3060	30	60	17050
3624	36	24	9100
3630	36	30	11550
3636	36	36	14250
3642	36	42	16500
3648	36	48	19000
3660	36	60	23900

Laboratory Tests

We are anxious that you learn of the savings that can be effected in your processes by means of magnetic separating equipment. To aid in the accomplishment of this we maintain a laboratory for the separation of samples of 5 to 25 lb. From the results complete reports and recommendations are prepared and submitted. Send samples fully prepaid to our works, Milwaukee, Wis.

"Stearns High Duty" Magnetic Clutches

The "Stearns High Duty" Magnetic Clutch is comprised of two elements, the magnet and the armature, the former usually keyed to the driver and the latter to the driven shaft. In open circuit position they are slightly separated preventing contact of friction surfaces. In closed circuit position, the armature is drawn gradually in contact with the magnet, due to magnetic lag, thus preventing grabbing. No manual effort required—remote control possible—horsepower delivered may be varied, all features not found in the mechanical clutch. The table may be used for preliminary consideration but we urge that our engineering department be consulted before ordering clutch. A great many types and sizes other than listed below are available on request or inquiry.

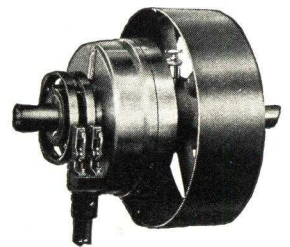
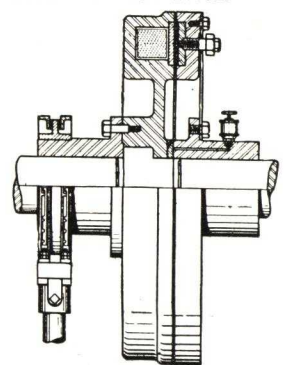


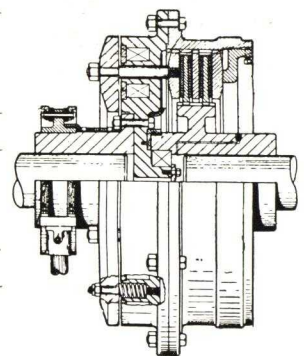
Fig. 205. "Stearns High Duty" Magnetic Clutch

"STEARNS HIGH DUTY" MAGNETIC CLUTCH DATA

Single Disc			
Size, in.	Hp. at 100 r.p.m.	Torque, ft.-lbs.	Watts, D-C.
7	.4	21	50
10	2.	105	100
12	3.5	184	115
14	6.	315	154
16	15.	787	175
20	30.	1575	225
24	50.	2625	300
28	80.	4200	360
32	120.	6300	400
36	160.	8400	530
Multiple Disc			
Size	Hp. at 100 r.p.m.	Torque, ft.-lbs.	Watts, D-C.
Two Disc			
221-4	70	3700	390
224-5	103	5400	480
224-6	124	6500	600
230-8	238	12500	700
238-9	386	20300	840
Four Disc			
421-4	141	7400	390
424-5	205	10800	480
424-6	247	13000	600
430-8	475	25000	700
436-9	771	40600	840
Six Disc			
621-4	211	11100	390
624-5	308	16200	480
624-6	371	19500	600
630-8	713	37500	700
636-9	1157	60900	840



Single Disc



Multiple Disc

Direct Current Solenoids

We also manufacture "Stearns High Duty" Solenoids.

Service

Thirty-two years of experience in this field not alone becomes evident in the design of the equipment but also in the fund of information we have accumulated regarding magnetic applications. Hence we are in a position to predict definite results and to guarantee satisfaction. Our engineers can help you in problems involving magnetic separation or special magnet applications and will do this without cost or obligation.

WESTINGHOUSE ELECTRIC & MFG. COMPANY

MANSFIELD WORKS

MANSFIELD, OHIO

For Sales Offices, Service Repair Shops and Agent-Jobbers, see Our Catalogue on Switchboards, Motors, etc., as Listed in Manufacturers' Index

For Other Westinghouse Products, see Manufacturers' Index

Electric Heat Treating Furnace Equipment

Westinghouse manufactures a complete line of heat treating furnaces for toolrooms and small and large production manufacturers. On this page are given some of the toolroom and small production furnaces normally carried in stock.

Box or Hearth Furnaces, Westinghouse Type H—These are adapted for all general heat treating operations where the temperature does not exceed 1850° F. (1010° C.).

They have features and capacities which will appeal to furnace users either in toolrooms or in manufacturing processes.

Heating elements are protected against accidental short circuiting from the work; designs are balanced for best over-all economies; doors, frames and brickwork are of unusually heavy construction to withstand the abuse to which furnaces of this type are ordinarily subjected.

Lead and Salt Pot Furnaces, Westinghouse Type J—These are used for heating operations where the piece being treated is brought up to heat by immersion in molten lead, salt or cyanide; desirable for small tools, such as drills, taps, dies, lathe and shaper tools, etc. They will operate up to 1600° F. (871° C.).

The heating elements of these pots are placed outside of the vessel and so arranged that the heat is distributed evenly. This arrangement keeps all parts of the bath at the same temperature, and in addition, prevents unequal strains in the vessel which cause short life and frequent shutdowns.

Wide flange nickel chromium alloy vessels are used, which effectively seal salt fumes from the furnace chamber.

Continuous and Large Production Furnaces—Other than toolroom and small production furnaces such as listed, Westinghouse builds large production and continuous furnaces.

The design of furnace recommended will be such as to reduce material handling problems to a minimum. Some of the large furnaces manufactured by Westinghouse are: Bell, Belt Conveyor, Pusher, Car, Walking Beam, Rotary Hearth, Roller Hearth, Counterflow Overhead Conveyor, and Box.

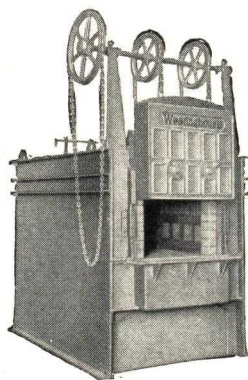
Industrial Electric Ovens

Primarily useful for armature baking, small part lacquering, baking finishes, core baking, and other industrial purposes.

Both types of ovens are arranged for automatic temperature control, by means of a thermostat and standard industrial heating control panel located where most convenient.

Type K Ovens—Designed for drying, baking, evaporating, and other applications requiring temperatures under 600° F. (316° C.). In special applications the ovens may be operated as high as 700° F. (370° C.). Natural ventilation only is provided as standard equipment.

Type M Ovens—Particularly applicable for armature and core baking, drying, and baking lacquers and finishes. Ventilation is by a blower system which removes explosive fumes and increases the drying rate. Maximum operating temperature 700° F. (370° C.).



Box or Hearth Furnace, Type H-54

Industrial Electric Heating Appliances

Automatic Electric Melting Pots—Made as shown below. Also made for tilting and bottom pouring applications. Standard sizes range from 10 to 1500 lb. for melting solder, babbitt, lead and other soft metals.



Electric Air Heaters—Standard sizes from 1 to 5 kw.



Type E



Type D Portable

Electric Space Heaters—For heating valve houses, crane cabs, ovens, metal moulds, hot tables, etc.



Electric Cartridge Heaters—For heating dies, embossing machines, shoe machines, etc.



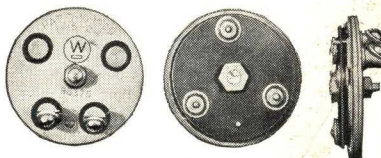
Electric Oil Immersion Heaters—For oil baths.



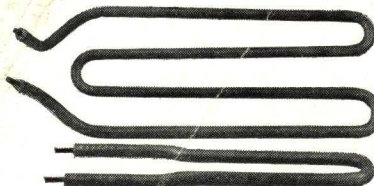
Vulcanizer Heater—With Built-in Watchman Thermostat.



Built-in Watchman Thermostat—For temperature control and element protection when used with electric heating elements on sterilizers, glue pots, oil purification, motor protection, etc.



Special Corox Tubular Heaters—For humidifying ovens, oil, and water heating.



EDWIN L. WIEGAND COMPANY

Electrical Heating Engineers and Manufacturers of Chromalox Heating Units

7507 Thomas Boulevard, PITTSBURGH, PA.

SALES AND ENGINEERING REPRESENTATIVES

ATLANTA, GA., 1000 Peachtree Street
BALTIMORE, MD., 211 No. Calvert Street
BIRMINGHAM, ALA., 2219 Fifth Ave., So.
BLOOMFIELD, N. J., 41 Morse Avenue
BOSTON, MASS., 120 High Street
BUFFALO, N. Y., 505 Delaware Avenue
CHICAGO, ILL., 20 East Jackson Boulevard
CINCINNATI, OHIO, 626 Broadway

CLEVELAND, OHIO, 561 Rose Building
DENVER, COLO., 1921 Blake Street
DETROIT, MICH., 2970 West Grand Boulevard
INDIANAPOLIS, IND., 2711 No. Penna. Street
KANSAS CITY, MO., 211 E. 14th Street
LOS ANGELES, CALIF., 912 East Third Street
LOUISVILLE, KY., 620 So. Fifth Street
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MINNEAPOLIS, MINN., 606 Plymouth Bldg.

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PORTLAND, ORE., 524 S. W. Pine Street
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SEATTLE, WASH., 911 Western Avenue

LICENSEES: IN CANADA, Canadian Chromalox Co., Ltd., Toronto 2, Ontario; ABROAD, George Bray Company, Ltd., Leeds, England

The Railway Utility Co., 2241 Indiana Avenue, Chicago, Ill., Sole Distributor of Chromalox Strip Heaters for use in heating railroad and street cars in the United States and Canada

Chromalox Products

The line of patented, embedded type Chromalox Heating Units comprises a wide variety of electric heaters for operating temperatures up to 1200° F., for all kinds of commercial, domestic and industrial purposes:

Air Heaters	Immersion Heaters:
Cartridge Units	Blade and Cartridge Type
Cylinder Units, Hollow	Heavy-duty, High-voltage
Disc Units	Oven Heaters, Industrial
"Finrods" and "Finstrips,"	Platen Heaters
for convection heating	Range Units:
of air or liquids	Super-Speed Reflector Type
Foundry Moulding Machine Heaters	Ring Units
High Voltage Railway Heaters	Space Heaters
Hot Plates	Special Heaters
Hotel Range Units	Strip Heaters
	Switch and Track Heaters, Railway

Patented Chromalox Construction



Strip Heater Construction

The heating element of all Chromalox units is a nickel chromium ribbon or spiral wire embedded in a refractory material under great hydraulic pressure—a patented process that makes the refractory an excellent conductor of heat and an equal good insulator of electricity. Element is entirely encased in rust-resisting iron, or in high-temperature sheathing material. No open ends or frayed mica to break off and collect moisture. All units furnace-fired at 1500° F. to vitrify the refractory material and make it moisture-proof. Both terminals project from same side, permitting snug clamping of units to flat surfaces. Every Chromalox Unit is tested for insulation breakdown at 1000 to 4000 volts a-c, depending on type of heating unit.

Typical Chromalox Installations

Chromalox Units are built to withstand constant vibration, power overloads, fluctuating current, and unreasonable operating conditions. Chromalox Heaters have helped solve roll pre-heating in sheet and tin mills. (Unit replacements run less than 1 per cent on the more than 20,000 Chromalox Strip Heaters equipping over 325 Freyn-Design Roll Heaters). Drying and baking ovens; tanks of compounds—glue, grease, tar; oils, solutions; batches of metal—on these and many other applications, Chromalox Heaters are being used.

Pipe lines carrying oil, lead, compounds are kept from "freezing-up" by these quickly installed strip heaters. Pre-heating fuel oil; heating crane cabs, valve houses, etc.; used as resistance to take up induction kicks—Chromalox Heaters are saving companies time and money by operating four and five years at a stretch—without quitting.

Chromalox Electric Strip Heaters

Strip Heater With One Terminal at Each End—Designed for general purposes wherever electric heat is required. In general, use iron-sheathed heaters where temperature of unit will not exceed 500° F.; use high-temperature sheathed wherever temperature of unit will be between 500 and 1000° F.



At 2 ft., 500-wall strip heater will run at black heat in open air; higher wattages will operate at red heat. On order, strip heaters can be bent to various diameters of not less than 10 in. to clamp around pipes, etc. For series operation on 440 volts or more, secondary bushings are supplied.

Standard ratings: Wattages, 150 to 1500; voltages, 115 and 230. Overall lengths: standard—8 to 43 in.; blunt end type—6½ to 40 in. Center-to-center of terminals, 5 to 38½ in. Center-to-center of mounting holes, 7 to 41¾ in. Width, 1½ in. Thickness, ⅝ in.



Strip Heater with One Terminal at Each End

Strip Heater With Two Terminals at One End—For use where strips are inserted from one end or are clamped on or between heavy metal plates, as on gluing machines, embossing presses, shoe machinery and metal pattern plates for moulding rubber or bakelite compounds.

Standard ratings: Wattages, 250 to 1000; voltages, 115 or 230. Overall lengths: Standard—10½ to 38½ in.; blunt end type—9 to 36 in. Center-to-center mounting holes, 9½ to 37¾ in.



Strip Heater with Two Terminals at One End

Chromalox Electric Immersion Heaters

Standard—Efficient and economical units for heating fluids in tanks, vats, kettles, boilers, stills, etc., where direct heat energy is desired. Extensively used for heating water, oils, acids, glues, paraffin, syrups, gasoline, caustics, cleaning and volatile solutions, tempering and pickling baths, etc. Blades or heating unit proper are of standard Chromalox Strip Heater construction. Simply drill a hole in container, thread with standard pipe thread (or attach standard pipe flange), and install unit.

Type M—For heating water and solutions that readily absorb heat. Supplied with-out control switch.

Type CM—Same as Type M except equipped with 3-heat switch mounted on combination terminal cover and outlet box for conduit or BX wiring.

Type MO—For heating mineral oils, paraffin and fluids that absorb heat less rapidly. No control switch supplied.

Type CMO—Same as Type MO except equipped with 3-heat switch mounted on combination terminal cover and outlet box for conduit or BX wiring.

Made with hand control switch and outlet box mounted on heater; also without hand control switch. For water heating, sheath is of copper, and screw plug is of bronze. For oil heating, sheath is of steel, and screw plug is of iron. Wattages, from 500 to 10,000; voltages, 115 and 230; diameter of standard pipe threads, ¼ to 2 in. Overall lengths, 10¼ to 53 in.; blade lengths, 6 to 45 in. Single-heat and 3-heat units.

Heavy Duty—Full information on request.

Miscellaneous Immersion Heaters—A wide variety of Chromalox Immersion Heaters is available to meet all kinds of service requirements.



Type M



Type CM

Chromalox Hot Plates

Round Type—For general laboratory purposes, coal analysis work, evaporating work. Typical heavy-duty Chromalox construction throughout. Long-lived high-temperature ring units are securely fastened to underside of smooth, turned grey iron top. Cadmium plated. Three-legged—no rocking, always level. All electrical connections fully enclosed. Complete with heavy-duty 3-heat switch, 6 ft. vulcanized rubber cord impervious to acids and alkalis. A special low temperature range of plates can be supplied for celluloid working and distillation of inflammable fluids.

Ratings: 1000, 1200, 1500 or 1800 watts.

Rectangular Type—Same sturdy Chromalox construction as round type plates except high-temperature strips are used. Rectangular plates can be built up to any multiple of 9x24 in. Frame made of unbreakable wrought angle iron. Heavy-duty 3-heat switch. Wattages, 3000 watts and up. Special alloy tops available to combat corrosion, acids or alkalis.

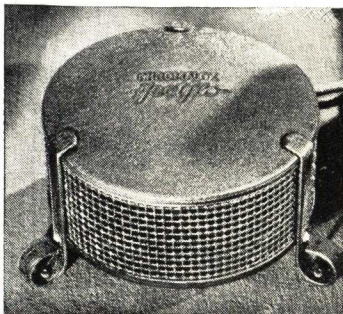
Chromalox Electric Air Heaters

Underwriters' Laboratories approval No. 76011. Horizontal, vertical and portable types for heating isolated shops, offices, crane cabs, valve houses and other hard-to-heat places. Completely assembled and easily installed. Mounted in black enameled, perforated, pressed steel cases. Fully assembled and have 3 ft. of cable and a 3-heat switch mounted on standard conduit box, ready to connect to power line. Suitable 1/4-in. diameter mounting holes in side flanges. Portable type has 3-heat switch built on side of heater.

All the Heat Is Utilized for Heating—Chromalox Air Heaters give the greatest amount of heat with minimum input of current. Heating elements are mounted with an insulating terminal block to a ventilated deflector, which in turn is mounted in heater case, eliminating necessity of extra fire-resisting material between heater and wall.

Automatic Temperature Control Can Be Furnished If Required—Complete wiring plans and instructions for installation sent with each order for temperature control. Installed by any competent electrician.

Chromalox Electric Heetflo (Motor Driven)—A patented



Chromalox-equipped motor-driven air heater, unique in design, operation and appearance, for heating around shops and offices, under desks, etc., ticket booths, watchmen's houses, laboratories, lavatories, and other small, isolated places. Picks up coldest air from floor, heats it and quickly circulates it *uniformly in all directions, downward to the floor.*

Safe; shockproof; no exposed wiring. No danger of damaging the heating element; fully enclosed and protected. Economical to operate. Light, portable, durable. Height, 5 3/4 in. Sturdily constructed and troublefree. Shaded-pole type motor. Oilless bearings. Artstyle bronze finish.

1025 watts; 115 volts; height, 5 3/4 in.; 9-in. diameter.

Type D Chromalox Electric Air Heaters—An inexpensive portable type of heater for small offices, shops, etc. Simple, yet sturdy in construction. Light in weight. The 1000-watt and 1500-watt heaters are supplied complete with 3-heat switch, 6 ft. of heater cord and attachment plug. The two larger sizes of heaters are designed for either heavy heater cord or conduit connections. Specify length

of cord or conduit required; supplied extra at nominal price.

TYPE D CHROMALOX ELECTRIC AIR HEATERS

For 115, 230 and 250 Volts—(3-Heat Switch)

Cat. No.	Overall length, in.	Overall width, in.	Overall height, in.	Wattage
EH-810	22	6	13	1000
EH-815	22	6	13	1500
EH-420	28	6	13	2000
EH-430	28	6	13	3000

Type H Chromalox Electric Air Heaters—For hard-to-heat places where heat must be concentrated near the floor. Ideal for mounting underneath low windows. Hundreds in use in shops and offices.

In the following table, the prefix EH-S indicates heaters having 3-heat switch and conduit box mounted on end of heater. The prefix EH indicates fully assembled heaters with 3-ft. flexible cable and 3-heat switch mounted on standard conduit box ready to connect to power line.



Inside View Type H Heater

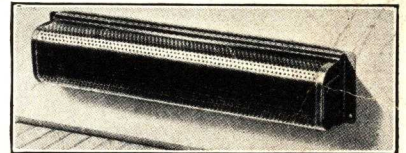
TYPE H CHROMALOX ELECTRIC AIR HEATERS

For 115, 230, 250, 440 and 550 Volts

Cat. No.	No. of units	Overall length including switch, in.	Wattage	Cat. No.	No. of units	Overall length including switch, in.	Wattage
EH-S 1801	2	25	1000	EH-1801	2	20 3/4	1000
EH-S 2401	2	30	1000	EH-2401	2	26 3/4	1000
EH-S 2405	2	30	1500	EH-2405	2	26 3/4	1500
EH-S 2406	4	30	2000	*EH-2406	4	26 3/4	2000
EH-S 2407	4	30	3000	*EH-2407	4	26 3/4	3000

*Can be supplied for 3-heat operation on 440 or 550 volts. All other heaters listed can be supplied for single-heat operation on 440 or 550 volts.

Type HV Chromalox Electric Air Heaters—Inexpensive auxiliary type for heating small places requiring equipment having the Underwriters' approval. Adapted for ticket booths, valve houses, fire extinguisher houses, etc. Mounted in any position—on walls, floors or ceilings. Because of their low wattage rating, they are not equipped with a switch, but are shipped from stock ready for direct connection to power line. Switch supplied at extra charge.



TYPE HV CHROMALOX ELECTRIC AIR HEATERS

For 115, 230 and 250 Volts

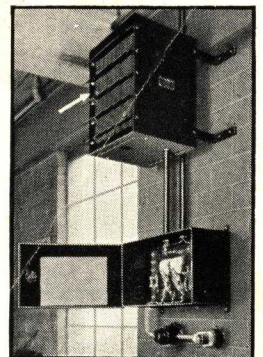
Complete with 6 ft. of heater cord and attachment plug

Cat. No.	No. of units	Overall length, in.	Overall width, in.	Overall depth, in.	Wattage
EH-122	1	14 1/2	5 7/8	4	250
EH-183	1	20 1/2	5 7/8	4	375
EH-245	1	26 1/2	5 7/8	4	500
EH-125	2	14 1/2	7	4	500
EH-187	2	20 1/2	7	4	750
EH-241	2	26 1/2	7	4	1000

Blower-type Chromalox-equipped Electric Unit Heaters

These units have low initial installation cost and require no maintenance. No costly steam boiler; no steam pipe upkeep; no steam pipe losses. With automatic temperature control, they insure dependable heat at the right temperature at lowest electrical cost. Operated only as required.

Available in sizes from 5 to 30 kw., for 115, 230, 250 or 440 volts, from various blower manufacturers. Give dimensions of space to be heated, also voltage (a-c. or d-c.).



THE ANTHONY COMPANY

Liquid Fuel Engineers

47-33 Fifth Street, LONG ISLAND CITY, N. Y.

Products

ANTHONY NEBULYTE SYSTEM for boilers and for furnaces; ANTHONY NEBULYTE OIL BURNERS, GAS BURNERS, TAR BURNERS, COMBINATION OIL, TAR and GAS BURNERS, TORCHES.

ANTHONY NEBULYTE OIL, TAR and GAS BURNING EQUIPMENT for all industrial heating processes.

ANTHONY NEBULYTE OIL and TAR SPRAYS for gas plants and SPRAYS for all liquids.

ANTHONY OIL, TAR and GAS FORGES, CRUCIBLE FURNACES and HEAT TREATING FURNACES.

ANTHONY SINGLE and DUPLEX STRAINERS; STEAM and ELECTRIC FUEL OIL HEATERS; TANK SUCTION UNITS; HAND and AUTOMATIC CONTROLS.

Engineering Service

Anthony engineers are prepared to discuss all heating problems and design special oil, tar or gas fired apparatus for specific needs. Having designed a great variety of successful industrial heat treating systems, they have wide experience in this field to place at a client's disposal. THE ANTHONY COMPANY since its organization has dealt with every application as an individual combustion problem, appreciating as no others have, its many sensitive and variable conditions, and accurately meeting these by correctly utilizing essential principles.

They are pioneers in the development of mechanical nebulization as applied to the combustion of liquid fuel, as well as in the application of those combustion principles which affect the accurate control of heat quality. Employment of their services leads to conservation of fuel, speeding up of production and better quality of output as 5,000 clients will testify.

More than 26 years of record-smashing success.

Anthony Nebulyte Systems

For Boilers—A mechanical nebulizing system which actually attains the perfection of radiant gas firing and normally produces 80% to 86% evaporating efficiency.

For Furnaces—A mechanical nebulizing system of gas firing with oil fuel, effecting an instantaneous conversion of liquid to gas by correct combination of essential elements.

Anthony Nebulyte Burners and Torches

The first free-acting nebulizers applied to industrial furnaces. Applicable whether forges, furnaces, stills, dryers, boilers, kilns or other apparatus require heat. Low and high pressure designs to suit every requirement.

70,000 installations of proven superiority.

Anthony Fuel Equipment

The continuous and successful operation of any fuel system depends upon the use of cor-

rect equipment, installed and adjusted in accordance with established facts. Special equipment for every part of liquid and gas fuel systems supplied, based upon the experience of many years. Tanks, pumps, blowers, valves, gauges, meters and all necessary appurtenances.

Anthony Nebulyte Sprays for Gas Plants

These are mechanical nebulizers of oil or tar—scientific distributors of spray. They are the means of distributing oil or tar in correct quantity over selected parts of a gas machine or generator as the operator may require.

Anthony Nebulyte Sprays are milestones in the progress of gas manufacture. All sprays are built to meet the scientific requirements of each installation. They are adapted to suit any prevailing conditions.

These sprays are of simple design and sturdy construction. They give perfect *nebulization*, positive control and correct distribution.

Anthony Nebulyte Sprays for All Liquids

Sprays supplied of definite capacity and throw which can be utilized for many purposes, such as cooling, aerating, atomizing, gasifying, mixing, absorbing gases and vapors, and for all purposes where it is desired to distribute a liquid in finely divided form over a large area, or through a large volume. Scientific distributors. Free acting. Conical and flat types.

Anthony Fuel Oil Heaters

Fuel oil heaters are essential in every oil burning system using oils of relatively heavy gravity.

Anthony heaters are supplied to give the required temperature to the particular grade of oil specified.

Furnished complete with safety relief valve, thermometer, and, where desired, automatic temperature control.

Anthony Strainers

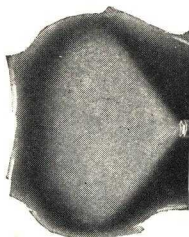
Both single and duplex types. In the duplex strainers, either side can be cut out by a single lever movement. They need not be taken apart for cleaning. They are easily applied to any pipe line.

The cleaning operation is made so simple that there is no excuse for strainers ever becoming foul.

Anthony Forges and Furnaces

These include rivet forges, crucible furnaces and a general line of heat treating furnaces built to take advantage of the superior operating characteristics of Nebulyte Burners.

Simple, compact, sturdy, non-oxidizing. Low operating cost. Portable and stationary.



ESTABLISHED 1900

HAUCK MANUFACTURING COMPANY

Manufacturers of Gas and Oil Burners and Oil Burning Equipment

MAIN OFFICE AND WORKS

137-147 Tenth Street, BROOKLYN, N. Y.

BRANCH OFFICES AND WAREHOUSES

CHICAGO, ILL., 4657 West Harrison Street

SAN FRANCISCO, CAL., 296 Second Street

Products

HAUCK VENTURI OIL BURNERS, high pressure (steam or compressed air) and low pressure air (8 oz. to 2 lb.).

MICRO VERNIER OIL REGULATING VALVES.

GAS BURNERS, high and low pressure types.

COMBINATION OIL AND GAS BURNERS.

TORCHES of all sizes for Heating and Repair Work in boiler shops, locomotive and car shops, machine and pipe shops, lighting powdered coal fires, etc.

CONCRETE HEATERS, ASPHALT, TAR and PITCH KETTLES; LEAD and BABBIT MELTING FURNACES; RIVET HEATING FORGES; THAWING OUTFITS; WEED BURNERS.

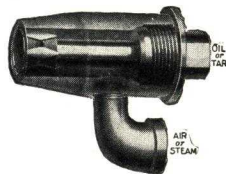
Also Foundry Equipments: Cupola Lighters, Ladle Heaters and Mould Dryers; Crucible Melting Furnaces.

Venturi High Pressure Oil Burners

Highly efficient with compressed air or steam pressure at 30 lb. per sq. in. gauge and higher. Burn 19° Baumé and lighter fuels without heating and all heavier oils if preheated.

The fine atomization of the oil by the Hauck Venturi principle is responsible for uniform and intimate mixing of oil and air, resulting in high oil burning efficiencies. That means: (1) a cleaner and hotter flame; (2) instantaneous and trouble-free lighting—without smoke; (3) unusually easy control from low to medium and high oil burning capacities and vice versa; (4) a substantial saving in oil.

Adaptable to all phases of industrial heating and heat treating. Made in five sizes with and without air control registers. Special burners for small furnaces, ovens and rivet heating forges. Also five sizes of large capacity oil burners for large melting furnaces, rotary kilns and dryers, and two sizes of flat flame burners suited to firing boilers, etc., where a spreading flame is desired. Ask for Bulletin No. 451 and submit your problems to us.



Venturi High Pressure Atomizer

Venturi Low Pressure Oil Burners

Made for two and three stages of atomization of all grades of fuel oil from 8° Baumé up, with low pressure air (from 8 oz. to 2 lb.) which is cheapest from the standpoint of first and operating cost without decreasing in any way the oil burning efficiency. The Hauck Venturi principle of atomization is used, resulting in the oil burning efficiencies listed above (see 1, 2, 3 and 4). Made in five sizes for two-stage atomization, Bulletin No. 401; and four sizes of three-stage atomization (single air connection) Bulletin No. 402. For use with preheated or recuperated air with or without automatic controls—four sizes of three-stage atomization (2 air connections), Bulletin No. 403. Air control registers furnished where necessary.

Let our extensive and varied experience assist with your oil burning problems.



Venturi Low Pressure Oil Burner, Two-stage Atomization

Micro Vernier Oil Regulating Valves

For the minute and positive regulation of any type oil burner. For use with any grade of fuel oil, tar not excepted, at all operating pressures. Saves fuel; avoids "clogging troubles"; saves time; eliminates that "fading away" flame so often experienced with needle and other type valves. As far superior to the needle valve as the needle valve is to the glove valve, for regulating purposes. Made in four sizes for

any volume up to 500 gal. per hour. Bulletin No. 701 gives full details.

Oil Burning Equipment

Turbo compressors, rotary oil pumps, fuel oil heaters and accessories, heavy duty single and duplex oil strainers, automatic safety oil shut-off valves, oil meters, etc. Bulletin No. 703.

Gas Burners

High and low pressure burners suitable for city gas, coke oven gas, water gas, natural gas, refinery gases, butane, propane, petroleum gas, and mixed gas.

Asphalt, Tar and Pitch Kettles

Burn kerosene. Melt 50 gal. of asphalt in 25 minutes—continuous supply thereafter. Made in 25, 50, 75, 100 and 150-gal. sizes—on legs or on steel or rubber-tired wheels. Bulletin No. 652.

Hand Pump Type Torches

Recommended where compressed air is not available. Must be preheated—just like the ordinary plumber's torch. Burn kerosene or coal oil. Save time and labor in making all repairs requiring heat, such as straightening shafts, axles, frames, buckled plates, girders, etc.; bending pipes, rails; melting babbitt out of bearings, etc. When used for preheating in welding, saves oxygen and acetylene. Send for Bulletin No. 151, describing various single and double burner combinations.



Hand Pump Type Torch

Compressed Air Type "Suction" Torches

Listed by Underwriters' Laboratories, Inc. for use with compressed air from 40 lb. per sq. in. gauge and up. No pressure in the tank or oil hose. Burn fuel oil of 28° Baumé and up and all distillates. Used for heating and repair work as covered in detail above. Made in various single and double burner combinations. Ask for Bulletin No. 301.

Other compressed air type "pressure" torches to be used with crude and heavy fuel oils. Made in various single and double burner combinations. Ask for Bulletin No. 251. Also special burners for lighting powdered coal fires.

Concrete Heaters, Salamanders and Water Heater

For winter construction. Concrete pouring can be finished in freezing weather with Hauck concrete heaters on mixers; salamanders for concrete protection and the water heater for concrete and mortar mixing, etc. Bulletin No. 501.

Lead and Babbitt Melting Furnaces

A combination of furnace and portable torch. Ideal for machine and repair shops. Made in different sizes—stationary and wheel types. Send for Bulletin No. 101.

Rivet Heating Forges

Operate with Venturi high pressure "suction type" burners—no pressure on the fuel oil or in the tank. Listed for safety in operation by Underwriters' Laboratories, Inc., Chicago. Made in 3 sizes for heating from 250 up to 500 3/4x3-in. rivets per hour. Write for Bulletin No. 351.

Thawing Outfits

Used by industrial plants, railroads and public utilities for thawing frozen coal hopper cars; thawing water pipes, switches; removing ice and snow from materials, etc. The speediest and most economical method of doing this work. Write for Bulletin No. 1014.



Thawing Outfit

FLINN & DREFFEIN COMPANY

Consulting Engineers and Builders of Industrial Fuel Equipment

110 North Franklin Street, CHICAGO, ILL.

Products

BITUMINOUS and ANTHRACITE PRODUCER GAS PLANTS for all kinds of industrial heating operations.

PRODUCER GAS CLEANING PLANTS for bituminous and anthracite coals.

RAW PRODUCER GAS BURNERS.

EQUIPMENT for MAKING GAS containing high percentages of carbon monoxide and carbon dioxide.

CONTINUOUS SLAB and BILLET HEATING FURNACES to use natural, coke oven and producer gas.

CONTINUOUS PAIR and PACK HEATING FURNACES.
Consultants on heating problems and processes.

Specialists in Industrial Process Heating Problems

For over a quarter of a century we have been actively engaged in the analyzing of industrial heating problems; designing and building complete fuel installations involving pipe and flue systems; special furnaces; perfecting processes involving fuel gas applications.

Our systems and processes are covered by basic patents. They effect large fuel savings and increase

production. Economies derived from our systems through savings in labor more than compensate for the capital outlay in remarkably brief periods.

A Few Prominent Installations

The Pyrites Company—Battery of ten mechanical anthracite producers.

City of Columbus, Ohio—Recarbonation plant.

City of Saginaw, Mich.—Recarbonation plant.

Mahoning Valley Sanitary District—Recarbonation plant.

McKeesport Tin Plate Co.—Raw and clean bituminous producer gas plants.

The American Rolling Mill Co.—Bituminous clean producer plant, continuous and slab heating furnaces.

Eastern Malleable Iron Co.—Mechanical anthracite producer.

Columbia Steel Co.—Normalizer and reheating furnaces.

Michigan Steel Corp.—Continuous pack and pair furnaces.

Youngstown Sheet & Tube Co.—Continuous pack and pair furnaces.

Tata Iron & Steel Co.—Continuous pack and pair furnaces.

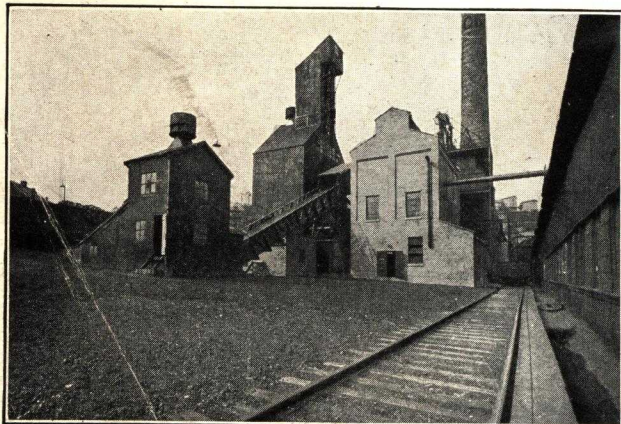
American Sheet & Tin Plate Co.—Continuous pack and pair furnaces.

American Steel & Wire Co.—Billet heating furnace.

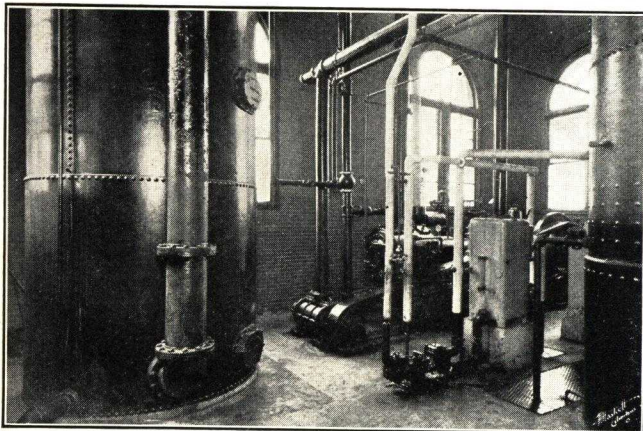
Acme Steel Co.—Billet heating furnace.

Allegheny Steel Co.—Continuous pack heating furnaces.

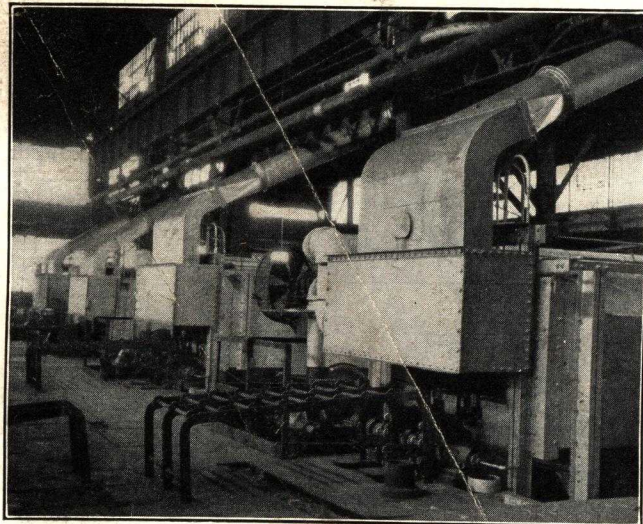
South American Packers—Sixteen anthracite producer gas plants.



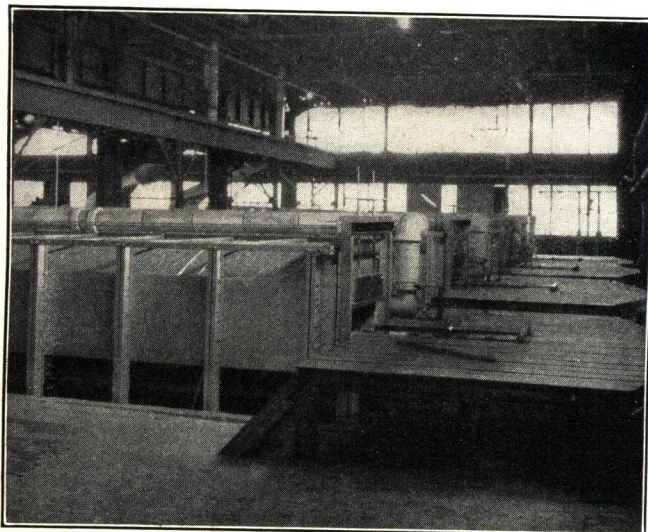
Building Group of a Large Bituminous Producer Gas Generating and Cleaning Plant



Recarbonation Plant, City Water Works



Discharging End



Charging End

Continuous Pair and Pack Furnaces Used in the Manufacture of Sheet Steel and Tin Plate

TIRRILL GAS MACHINE CORPORATION

ESTABLISHED 1864

75 West Street, NEW YORK, N. Y.

WORKS: NETCONG, N. J.

THE TIRRILL GAS MACHINE

Generates and delivers at low cost a steady supply of non-poisonous gas. It burns smokelessly with a brilliant white or a hot blue flame as may be desired, and without odor. It is suitable for all industrial purposes and for cooking, heating and lighting purposes in residences, laboratories, hospitals, colleges, factories and for small municipal gas plants in communities not provided with gas.

Materials

The entire plant is constructed of the best obtainable corrosion-resisting metals and is of first-class workmanship throughout. It is completely put together and tested out at the factory before shipment.

Operation

The machine consists of three simple units: air pump, gas generator, mixer.

The air pump or meter (A) furnishes the necessary air and pressure to deliver the gas. This pump is operated by a suspended weight wound up by hand, by means of water pressure, water wheel, or automatic electric motor.

The gas generator (B), with inside carburetor and float, acts as a reservoir for the liquid gas and mixes air with the vapor of the liquid, forming a permanent gas.

The mixer (C) functions to thoroughly mix or equalize the vapor from the generator with a given quantity of air from the air pump, thus insuring a supply of smokeless, high heat value gas of uniform quality.

Advantages

Safety—The machine mixes the gas outside the building underground. It makes a gas that contains no carbon monoxide; hence it is absolutely non-poisonous. It produces and distributes the gas noiselessly and requires no heat to operate it. In producing this gas no dangerous high pressures are used.

Tirrill gas apparatus is listed by the National Board of Fire Underwriters as Standard Class "A" equipment, and its installation does not increase insurance rates.

Economy—The cost of Tirrill gas is much lower than that of any other compressed or liquid gas. Under average conditions in the United States, the amount of Tirrill gas equivalent in heating value to 1000 cubic feet of average city gas is produced by the Tirrill gas machine for \$1.00 to \$1.25. This is cheaper than any bottled gas and cheaper than city gas as sold in many communities.

Simplicity—The apparatus is easily installed and connected up to any existing gas piping. Any pipe fitter can install the apparatus in a short time by following the instructions for erection. It requires no attention beyond an occasional (once or twice a year) filling of the generator tank with the Tirrill liquid gas.

As the tanks have a considerable capacity, frequent fillings are not required as is the case with bottled gas.

Efficiency—The Tirrill gas machine gives positive, continuous service—the gas being automatically made only as needed and no made gas being stored. The opening of a burner cock to a stove,

heater, or any other appliance connected to the pipe system, starts the generator making gas, and the shutting off of the burner cock automatically stops the generator making gas. Variations in temperature have no effect on the efficiency of the gas machine's operation.

Durability—As only the highest grade materials and workmanship are employed, once installed, the system requires no upkeep or repairs. There are many Tirrill gas machines in use today which were installed thirty or forty years ago, and these are still giving perfect satisfaction to their owners.

Industrial Installations

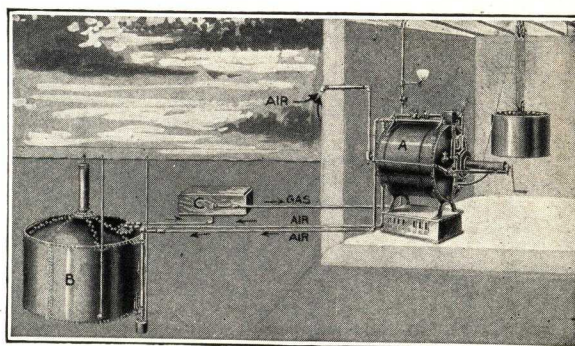
Where gas is required for operating industrial plants, and where electric power is available, a blower may be installed and be used in place of the Air Pump "A," Mixer "C" and the Weight Box.

CAPACITIES AND SIZES OF TIRRILL MACHINES

Machine No.	2	3	4	5	6	7
Gas delivered per hr. cu. ft.	300	400	550	850	1100	2200
Gas pressure..... in.	2	2½	2½	2¾	3¼	3½
Equalizing pressure						
Meter (A):						
Length..... in.	56	64	70	75	86	97
Height..... in.	45	47½	47½	57	61	61
Diameter..... in.	29	35	35	42	48	48
Weight box:						
Height..... in.	24	24	24	24	24	24
Diameter..... in.	26¼	34½	39½	44	52½	60¼
Total weight for loading weight box..... lbs.	1000	1250	1550	2400	3500	4500
Note: We can supply CI counterweights in place of weight box where desired.						
Generator (B):						
Height (with dome)..... in.	68	69	70	80	82	96
Diameter..... in.	45	53	59	65	75	100
Capacity..... gals.	200	250	300	500	700	1250
Mixer (C):						
Height..... in.	12	14	14	14	15	18
Diameter..... in.	42	46	46	46	52	65
Shipping weight..... lb.	1222	1500	1775	2260	3475	4000

Installation Service

The Tirrill Corporation is prepared to undertake the installation of its gas machines by experienced service men, or to refer customers to reliable local firms who will undertake the work.



The Tirrill Gas Machine

THE CARBORUNDUM COMPANY

REFRACTORY DIVISION

PERTH AMBOY, N. J.

DISTRICT SALES BRANCHES

CHICAGO

CLEVELAND

DETROIT

PITTSBURGH

PHILADELPHIA

AGENTS

EL PASO, TEX., Denver Fire Clay Co.

SALT LAKE CITY, UTAH, Harrison & Co.

SEATTLE, WASH., Pacific Abrasive Supply Co.

LOS ANGELES, CAL., Pacific Abrasive Supply Co.

SAN FRANCISCO, CAL., Pacific Abrasive Supply Co.

MONTREAL, QUE., Williams & Wilson, Ltd.

ST. LOUIS, MO., Christy Fire Brick Co.

TORONTO, ONT., Williams & Wilson, Ltd.

SPECIAL REPRESENTATIVES FOR OIL REFINERIES

PHILADELPHIA, PA., Alcorn Combustion Co.

After years of extensive research and development in the use of silicon carbide as a refractory, the Refractory Division of THE CARBORUNDUM COMPANY was established in the year 1912. Early in 1919, the Refractory Division was transferred to a separate and well equipped plant at Perth Amboy, N. J.; this plant is the largest of its kind in the world devoted exclusively to the manufacture of super-refractories. All of the vast resources, experience, and facilities of THE CARBORUNDUM COMPANY are here combined to produce refractory materials of the highest type.

Products

Refractories—

"Carbofrax" and "Silfrax" (Carborundum Brand Silicon Carbide) and "Alfrax" (aluminum oxide) refractory brick, tile, special shapes, and high temperature cements.

"Refrax" (recrystallized silicon carbide) brick.

"Carbofrax," "Silfrax," and "Alfrax" kiln furniture, saggars, and bats.

Carborundum Brand Silicon Carbide grain.

Carborundum Brand Firesand.

"Infrax" insulating firebrick and cement.

"Alfrax" embedding cements.

"Firefrax" high temperature cements.

Furnaces and Kilns—

"Carboradiant" Combustion Chambers.

(Reg. U. S. Pat. Off.)

Carborundum Company Recuperators (Licensed under the Fitch Patents).

Trade-Marks

"Carborundum," "Carbofrax," "Refrax," "Aloxite," "Silfrax," "Alfrax," "Firefrax," "Infrax," and "Carboradiant" are registered trade-marks of THE CARBORUNDUM COMPANY for products of its manufacture.

Engineering Service

In addition to manufacturing refractory materials, the Refractory Division of THE CARBORUNDUM COMPANY maintains a well organized furnace and refractory engineering department equipped to render engineering service to all operators of furnace equipment particularly relative to the use of super-refractories.

Carborundum Brand Silicon Carbide

"Carborundum" is the registered trade-mark of THE CARBORUNDUM COMPANY for the material chemically known as silicon carbide. It is a product of the electric furnace, produced by the chemical combination of coke and silica sand at a temperature of 4000° F. This crystalline substance is not melted at any temperature up to its decomposition point, which is about 2240° C. (4064° F.). Above this temperature it dissociates into its elements, silicon and carbon.

Carborundum Brand silicon carbide has a thermal conductivity approximately ten times as great as that of fireclay, and much higher than that of any other commercial refractory material. It has a coefficient of expansion of .000005 per degree C. from 0° to 1500° C. It is extremely resistant to chemical action, being inert to nearly all reagents except basic substances at high temperatures.

Aloxite Brand Aluminum Oxide

Aloxite Brand aluminum oxide is produced in an arc type electric furnace by melting bauxite. Upon cooling it crystallizes into a highly pure, dense form of aluminum oxide (Al_2O_3) having a melting point higher than 2000° C. (3722° F.).

"Aloxite"

Trade-Mark
Reg. U. S. Pat. Off.

"Carbofrax" Refractories

"Carbofrax" Refractories, being composed principally of Carborundum Brand silicon carbide, inherit the desirable properties of the latter, as indicated by the following data:

"Carbofrax"

Trade-Mark
Reg. U. S. Pat. Off.

(1) **Refractoriness**—Sufficient to withstand temperatures in excess of 3000° F. without softening or oxidizing.

(2) **Spalling Tendencies**—"Carbofrax" has the lowest spalling tendency of any commercial refractory.

(3) Average Cross Breaking Strength—

Material	Modulus of rupture, lbs. per sq. in.	
	20° C.	1350° C.
"Carbofrax" Brick.....	2103	900
Silica Brick No. 1.....	608	145
Fireclay Brick.....	665	113
Magnesite Firebrick.....	1338	136

(4) Thermal Conductivity—

Material	Mean thermal conductivity in B.t.u. per sq. ft. per in. per deg. F. per hr. for temperatures of 600° C–1350° C.
"Carbofrax" (Carborundum Brand, Silicon Carbide).....	108
"Alfrax" Aloxite Brand Aluminum Oxide.....	23
Silica Brick.....	12
No. 1 Fireclay Brick.....	9

(5) **Contraction**—No contraction or shrinkage at any commercial temperature.

(6) **Resistance to Abrasion**—At least ten times greater than best grade of fireclay brick.

"Carbofrax" Brick—"Carbofrax" Brick are carried in stock in large quantities in all of the standard 9-in. series shapes, also in the more commonly used shapes of the 6 and 13½-in. series.

These brick are used extensively in all types of coal, oil, and gas fired furnaces and kilns to effectively resist flame impingement, high temperature, abrasion, clinker trouble, rapid change of temperature, and to transmit heat or carry severe loads.

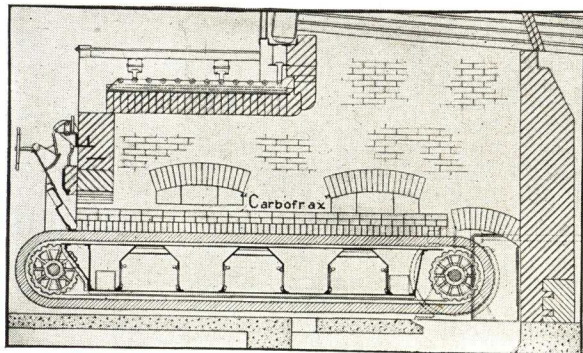
Kiln fireboxes or supporting arches constructed of "Carbofrax" brick will render a degree of service that insures ultimate economy.

"Carbofrax" Tile and Shapes—Shipment from stock may be had on orders for approximately thirty different sizes of "Carbofrax" plain rectangular tile ranging from 12x12x1½ in. to 27x12x3 in. Non-standard sizes of plain rectangular tile and special shapes require only a few weeks for manufacture and delivery.

"Carbofrax" in Boiler Furnaces

The trend in modern boiler and boiler furnace design has been toward increased steam production per unit, greater ease of operation, and greater durability, with reduced operating costs.

From the standpoint of the furnace this development has usually resulted in increased heat release per cubic foot of furnace volume, higher temperatures, and the imposing of more severe service conditions on the refractories necessary for furnace construction. Each specific type of furnace or fuel requires a special study of its refractory requirements. Only proper analysis of the conditions and correct specification and utilization of the materials of construction will result in a satisfactory installation. No one refractory material is capable of giving best results for the complete construction of any boiler furnace when ultimate economy is the objective.

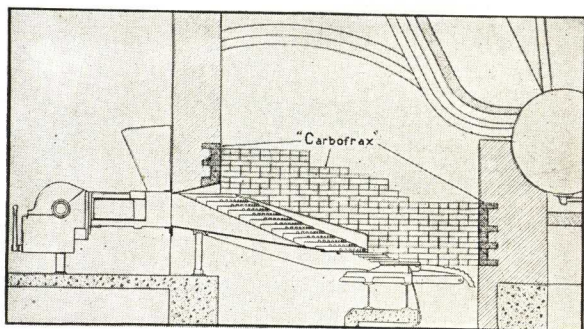


Recommended location for "Carbofrax" Brick with Chain Grate Stoker. Installed as shown "Carbofrax" Brick eliminate clinker adhesion and abrasion along the grate line

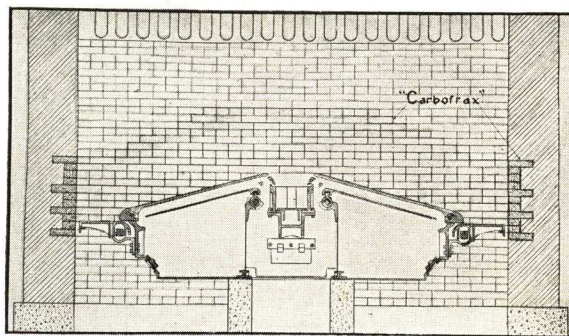
THE CARBORUNDUM COMPANY has specialized in the manufacture and manner of application of its refractory products in the power field. These products have been successfully used for boiler furnace construction for the past twenty years and their development has kept pace with the changes in requirements during that period. In practically every installation, regardless of type, they may be used to advantage in some location.

In most stoker and hand fired boiler furnaces the severest refractory service conditions exist in that portion of the walls in and immediately above the fuel bed. In this zone the refractories are subjected to the highest temperatures as well as mechanical and flame erosion. Furthermore, unless suitable materials are used clinker adhesion will occur resulting in destruction of the walls due to slice barring and reduction of furnace efficiency and capacity because of the decreased effective grate area caused by the building out of clinker.

"Carbofrax" is used in these locations for the complete elimination of trouble from these causes. Its refractoriness, great mechanical strength at high temperatures, freedom from spalling, and resistance to mechanical or flame erosion make it ideal for the purpose. Its impervious, dense surface prevents clinker adhesion.



Recommended construction and location for "Carbofrax" Brick in side, bridge, and front walls of Multi-retort Underfeed stoker settings. Their use insures long life and positive elimination of clinker adhesion. Because of freedom from barring the usual shattering and breaking away of linings are eliminated, thus protecting the entire setting



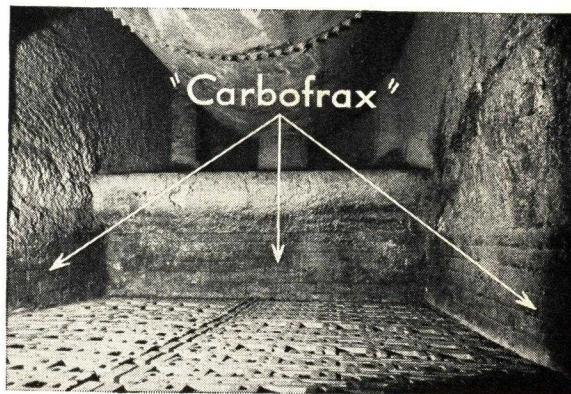
Recommended arrangement of "Carbofrax" Brick for lining single retort stoker settings. Severe service and clinker adhesion troubles are by no means confined to large boiler units. "Carbofrax" Brick are as useful in eliminating clinker adhesion and erosion in small installations as they are in super stations

Successful installations now numbering in the thousands are in operation today, testifying to the value of "Carbofrax" in such applications and a useful life of four or five years is not exceptional under conditions causing the failure of fireclay refractories in as many months.

"Carbofrax" brick may be used to advantage in the wall zone of the fuel bed in any stoker or hand fired boiler setting regardless of the quality of the coal.

Above the fuel bed they may be used for resistance to high temperature and flame erosion when high grade coals are used, but they are not recommended in this location for coals having a high iron content because of the fact that molten slags high in iron will react chemically with "Carbofrax," although "Carbofrax" resists the effect of iron slags to a greater extent than will fireclay. However, in such installations the high thermal conductivity of "Carbofrax" is utilized by air or water cooling to prevent this action.

The recommended location and proper construction for the use of "Carbofrax" brick in non-cooled furnace linings based on actual experience with such installations is illustrated.



"Carbofrax" Brick in Hand Fired Boiler Furnace Lining. In this installation "Carbofrax" has given an average life of four years as compared with six months for fireclay, formerly used. Lining costs have been reduced 60 per cent and during their useful life in this and four other similar boilers "Carbofrax" has saved this user \$3425 as compared with former costs with fireclay. Certified performance data supplied on request

The Carborundum Company Recuperator

This type of recuperator built under the Fitch patents, employs "Carbofrax" as the heat transmitting medium utilizing the high heat conductivity of this material. The air passages consist of "Carbofrax" refractory tubes and through their use a maximum of efficiency in heat recovery is secured. The Recuperator design embraces several novel features such as: Accessibility of essential parts for inspection and repairs, reduction of leakage possibilities to a minimum, and means for producing turbulence and preventing stratification. This recuperator is highly suitable for use with continuous or intermittent furnaces.

JOHN A. ROEBLING'S SONS COMPANY

Welding Wire and Electrodes

TRENTON, N. J.

For Branch Offices and Warehouses, see our Wire Rope and Accessories Pages

For Electrical Wires and Cables, Wire Rope and Accessories, see Manufacturers' Index

Roebling Welding Wire and Electrodes

Roebling Welding Wire for acetylene (gas) welding and for electric (arc) welding is giving satisfactory service and demonstrating its efficiency and reliability in steel works, shipyards, railroads, industrial plants, mines, automobile and repair shops.

Made to standard specifications, but special analyses can be furnished on special order.

Roebling Gas Welding Wire—Is 99.75% pure iron, copper-coated to distinguish it from wire for electric welding. Pure, uniform, soft, tough, free from occluded gases, oxides and surface imperfection or mechanical faults of all kinds.

Standard Low Carbon Welding Wire—Used with all makes of welding equipment. Furnished in bundles of 14-in. lengths, or in coils. Uniform in quality and makes strong, sound and tough welds.

Wire for *automatic electric welding* must be smooth, cylindrical, free from surface imperfections, kinks or other mechanical injuries in order to feed freely in process of welding. Roebling Electric Welding Wire (standard low carbon) is furnished in coils which will not deform nor tangle with rough usage. A suitable reel to fit these coils is furnished at a moderate price on initial orders. Coils weighing from 50 to 200 lbs. each can be used on the same reel.

Special Annealed Low Carbon Electrodes—For all makes of electric welding equipment. Where it is desirable to sacrifice to a slight degree, strength and ductility to obtain greater ease in welding, or where amperage is slightly insufficient, Roebling Special Annealed Electrodes should be used. The penetration is less than with standard electrodes.



ROEBLING WELDING ELECTRODES AND WIRE

Type	Analysis, % of					Amer. Weld'g Soc. spec.	Length inches †	Standard stock sizes, inches	
	Carbon	Man-ganese	Sulphur	Phos-phorus	Silicon				
Electric Arc Welding Electrodes									
†Standard Low Carbon	.13 to .18	.40 to .60	negligible	negligible	negligible	E-1-B	14	$\frac{3}{16}, \frac{1}{4}, \frac{3}{8}, \frac{1}{2}, \frac{5}{8}, \frac{3}{4}, \frac{7}{8}, 1$	
Special Annealed L. C.	.08 to .13	.20 to .40	.04 max.	.04 max.	trace	.....	14	$\frac{3}{16}, \frac{1}{4}, \frac{3}{8}, \frac{1}{2}, \frac{5}{8}, \frac{3}{4}, \frac{7}{8}, 1$	
Standard High Carbon	.90 to 1.00	.....	.04 max.	.04 max.	.....	E-1-C	36	$\frac{3}{4}, \frac{3}{8}, \frac{1}{2}, \frac{5}{8}, \frac{3}{4}, \frac{7}{8}, 1$	
Special High Carbon	.90 to 1.00	.....	.04 max.	.04 max.	.....	E-1-C	36	$\frac{3}{4}, \frac{3}{8}, \frac{1}{2}, \frac{5}{8}, \frac{3}{4}, \frac{7}{8}, 1$	
Special High Man-ganese	1.00 to 1.30	11.00 to 14.00	.....	.....	.....	.....	18	$\frac{1}{4}, \frac{3}{8}, \frac{1}{2}, \frac{5}{8}, \frac{3}{4}, \frac{7}{8}, 1$	
Gas Welding Wire									
†American Iron	99.75% pure iron						G-1-A	36	$\frac{3}{8}, \frac{3}{16}, \frac{1}{4}, \frac{5}{16}, \frac{3}{8}, \frac{1}{2}, \frac{5}{8}, \frac{3}{4}, \frac{7}{8}, 1$

*Furnished on special order.

†Also stocked in coils of approximately 100 lbs. each.

‡All rod stock is shipped in burlapped bundles of 50 lbs. each.

Special sizes can be furnished on order.

Standard High Carbon Electrodes—To secure greater strength or resistance to abrasion in welds, which can be ground to size, high carbon electrodes are used. The deposited metal, in ordinary practice, will analyze about 0.60% carbon. The metal deposited with medium carbon steel analyzes with very little difference from mild steel.

Special High Carbon Electrodes—When the standard direct-current motor-generator set is not available, Roebling Standard High Carbon Electrodes are used. These electrodes are of the same analysis as the standard higher carbon, but through special heat treatment possess high conductivity and make sounder welds under variable current conditions. Welds are not machinable, but must be ground to size.

Special High Manganese Steel Electrodes—Used where extraordinary hardness, with great toughness are required. Not machinable, but must be ground to size. Metal deposited has the peculiar property of hardening with great toughness with sudden cooling, such as quenching. Slow cooling makes metal extremely brittle and hard.

Electric Arc-welding Machine Cable

Plain Rubber Sheath—Plain rubber sheath welding cable is recommended for use where service conditions are too severe for braided cables. The first cost of plain cable is rela-



Arc-welding Cable, Style R.P.

tively high, but the added life obtained under conditions of excessive moisture, or unusual abrasion to which the cable is subjected, justifies its use.

In the pigtail construction it may be used as either electrode holder or trailing cable. If unusual flexibility is not required, extra flexible strand with plain rubber sheath is recommended.

Electrode Holder Cables—Extremely flexible because of thousands of wires making up conductor. This minimizes resistance to flexure, reduces fatigue of operator's wrist, allowing longer intervals of continuous operation and more accurate control in guiding electrode. The result is better workmanship and lower production cost.



No. 0000 A.W.G. Electrode Holder Cable, Style B

Style B is more flexible than Style R, the conductor is "pig-tail" strand insulated with a heavy strong white cotton braid and a heavy durable seine twine braid treated with a moisture resisting compound. **Style R** is used when circuit is exposed to damp conditions. The conductor is "pigtail" strand insulated with a wrap of cotton, a heat resisting rubber compound, an open cotton braid and a heavy durable seine twine braid treated with a weatherproof compound.

METALS AND TOOLS

• • •

MISCELLANEOUS FACTORY EQUIPMENT

THE BLACK & DECKER MFG. CO.

Portable Electric Tools
TOWSON, MARYLAND

"If It Has a Pistol Grip and Trigger Switch, It's a Black & Decker"

Black & Decker Electric Tools are carried in stock by the leading electrical, mill supply, machinery, plumbing, hardware, and automotive supply houses. Call your regular supply house on the 'phone.



The 1/4-in. Heavy
Duty Electric
Drill



The 1/2-in.
Special Electric
Drill

Portable Electrical Drills

In the complete line of Black & Decker Portable Electric Drills, you will find a unit for every purpose. Odd job drilling, continuous production service, maintenance operations—or for use in combination with Bench and Post Drill Stands as efficient Drill Presses. All units, except the 1/4-in. Light Duty Drill, are designed for continuous service. The 1/4-in. Light Duty Drill, designed for intermittent use, is ideal for the man who "goes out on the job." The entire line of production drills (excepting 1/4-in. Light Duty) is featured by generous use of ball bearings. Heavy Duty drills from 1/2-in. up have full anti-friction bearing construction. Universal motors increase the usefulness of the units, since any drill may be operated on alternating or direct current. This is particularly important to the man who takes a tool out on a job.

SPECIFICATIONS

Unit size, ins.	Net weight, lbs.	No-load speed, r.p.m.	Price, all voltages
1/4 Light Duty.....	5	2000	\$ 28.00
1/4 Heavy Duty.....	7 1/4	2000	42.00
5/16 Ball Bearing.....	7 1/2	1400	48.00
1/2 Special.....	12 1/2	400	50.00
1/2 Heavy Duty.....	16 1/2	500	68.00
5/8 Standard.....	17 1/2	500	68.00
5/8 Heavy Duty.....	22 1/2	450	84.00
3/4 Standard.....	23 1/2	425	78.00
3/4 Heavy Duty.....	26 1/2	375	94.00
7/8 Heavy Duty.....	26 1/2	375	94.00
1 Heavy Duty.....	27 1/2	350	108.00
No. 8.....	66	350	200.00

1/4-in., 1/2-in. Light Duty and Heavy Duty, 5/8-in. Standard—standard voltage, 110, other voltages, 32, 220, or 250, no extra charge.
5/8-in. Heavy Duty, 3/4-in. Light and Heavy Duty, 1-in. and No. 8—standard voltage, 110, other voltages, 220 or 250, no extra charge.



Portable Drill Stands

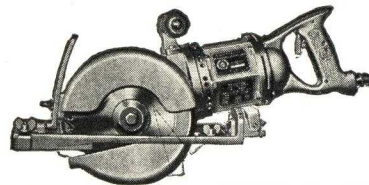
These stands give a 6 to 1 leverage, enabling operator to exert tremendous pressure on work.

Stand	Will accommodate the following sized drills, ins.	Weight lbs.	Price
No. 5B—bench	All 1/4 and 5/16	14	\$14.00
1/2-in.—Special	1/2 Special Drill only.....	44	20.00
No. 3—bench		56	28.00
No. 3—post	3/8, 1/2 Spec., 5/8 Std., 3/4 Std.....	65	32.00
No. 3—pedestal		95	38.00
No. 6—bench		56	32.00
No. 6—post	1/2 H.D., 5/8 H.D., 3/4 H.D.,	65	36.00
No. 6—pedestal	3/8 H.D., 1 H.D.....	95	42.00

Be sure to mention drill code number when ordering, so that proper adapter can be supplied.

Portable Electric Saws

For all types of construction work. Also useful for cutting marble, transite, asbestos, etc., with abrasive disc. Shoe adjustable from 0° to 45°. Universal motor.



Size of saw, ins.	6	8	10
Diameter saw blades, ins.	6	8	10
Depth of cut (adjustable), ins.	1 3/4	2 1/2	3 1/2
No-load saw speed (r.p.m.)	3000	2500	2000
Net weight (lb.)	18 1/4	26	33 3/4
Price, all voltages	\$110.00	\$150.00	\$180.00

Standard voltage, 110. Other voltages, 220 or 250, no extra charge. 6-in. saw also furnished for 32 volts.

Portable Bench Grinders

Made in three sizes for general grinding, buffing, tool sharpening, etc.



6-in. special (110 V. a-c. only)	\$28.00
6-in. ball bearing (110 V. a-c. only)	38.00
7-in. ball bearing (d-c. and single phase a-c. only)	56.00
10-in. ball bearing (d-c. and single phase a-c. only)	118.00

Portable Electric Grinders

Made in three sizes—4, 5 and 6-ins. Ideal for portable grinding where considerable metal is to be removed, buffing, and wire wheel brushing.

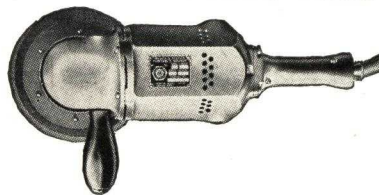


4-in. Grinder.....	\$ 60.00
5-in. Grinder.....	80.00
6-in. Grinder.....	100.00

Equipped with Universal Motors—operate on a-c. or d-c.

Portable Electric Sanders

For sanding, grinding, cleaning and smoothing. Can be used with abrasive discs—from fine sand-paper to coarsest emery. Used widely for sanding metals before painting, etc. Universal motors.



7-in. (Straight Type).....	\$68.00
7-in. Heavy Duty (Right Angle Type).....	68.00
9-in. (Straight Type).....	88.00

Wire Wheel Brushes

Revolved by 1/4-in. Heavy Duty Drill, mounted in Bench Stand.

00501 4-in. wire wheel brush.....	\$1.50
00525 Arbor for 4-in. brush.....	1.00
00311 Stand for 1/4-in. heavy duty drill.....	2.50
00176 Stand for 1/4-in. light duty drill.....	1.75

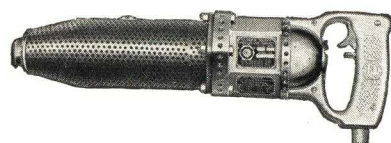


Hole Saws

Cut clean, round holes in metal or any other material that can be cut with a hack saw. For use with 1/2, 5/8 and 3/4-in. drills. Made of finest quality tungsten steel, carefully hardened for durability.



Portable Electric Hammers



Particularly useful where any type of hammer action is necessary, such as drilling holes in concrete, stone, marble, etc. Also ideal for scaling paint, rust from boilers, etc. Universal motors.

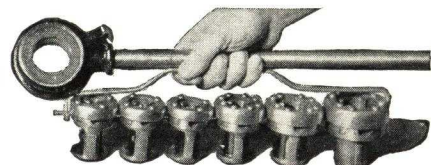
	No. 2	No. 4	No. 6
Drilling capacity, ins.	5/8	1 1/8	1 1/2
Number of blows per min.	3300	2900	2900
Net weight, lb.	10	16 1/2	23
Overall length, ins.	16 5/8	19	20 3/4
Price, all voltages	\$125.00	\$175.00	\$225.00

Standard voltage, 110. Other voltages, 220 or 250, no extra charge.

THE BORDEN COMPANY

The Improved Line of Beaver Pipe Tools

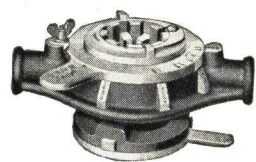
193 Dana Avenue, WARREN, OHIO



**No. 3 Beaver Ratchet— $\frac{1}{8}$ to 1 In.
Bolt Dies— $\frac{1}{4}$ to 1 In.**

Ratchet mechanism fully enclosed—no teeth on die head to become mutilated. Oil holes in die heads for easy oiling and chip clearance. Dies square in shape; reversible. No weak sections to break. Handy die-head carrier pin. Right or left.

Net Prices—No. 3 complete, $\frac{1}{4}$ to $\frac{3}{4}$ in., \$12.75; $\frac{3}{8}$ to 1 in., \$13.50; $\frac{1}{2}$ to 1 in., \$15.75; $\frac{1}{4}$ to 1 in., \$18.00.

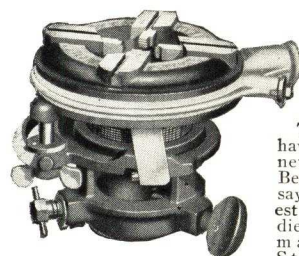


**No. 6
Beaverette
 $\frac{1}{4}$ to $\frac{3}{4}$ In.**

Threads $\frac{1}{4}$ to $\frac{3}{4}$ in. without changing dies or bushings. Instantly adjusted for over, under or standard.

Universal pipe guide accurately centers the pipe. Improved locking device (now on top). Right or left.

Net Prices—No. 6 Beaverette complete, $\frac{1}{4}$ to $\frac{3}{4}$ in., \$12.00. Extra dies, per set, $\frac{1}{4}$ in.— $\frac{1}{4} \times \frac{3}{8}$ in. or $\frac{1}{2} \times \frac{3}{4}$ in., \$2.25.



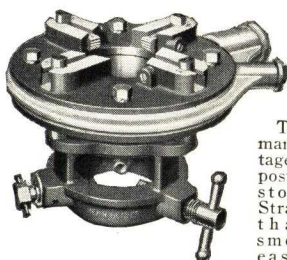
**No. 12-R
Beaver
1 to 2 In.**

Fully self-contained and adjustable.

Those who have used the new No. 12-R Beaver Ratchet say it is "the finest self-contained die stock ever made." The Straight-Line Pull (ratchet on

the die head) insures smooth and easy cutting, good threads and minimum wear on dies and tool. The self-contained rear-end centers the pipe accurately (no bushings). Cuts uniform drip threads and close nipples. Exceptionally rugged, yet weighs only 16 lbs. Made of certified malleable iron to withstand hard use. Right hand only.

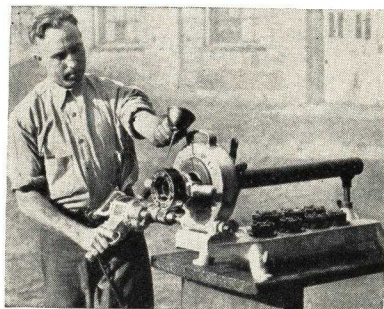
Net Prices—No. 12-R One-handle Ratchet, complete, \$15.00; No. 12-RX Two-handle Ratchet, complete, \$16.00; Extra Dies, per set (threads four sizes), \$1.50.



**No. 8-R
'4-post'
Beaver
1 to 2-in.
Ratchet**

These tools offer many new advantages in the "4-post" type of die stock—such as, Straight-Line Pull that insures smoother and easier cutting; sharper threads; longer die life; less repair expense. Accurate and self-contained Rear End that cuts uniform drip threads and close nipples; positive die retaining device—dies cannot become lost; interchangeable die segments. The lightest and strongest 1 to 2-in. ratchet tool made.

Net Prices—No. 8 Plain, complete, \$10.50; No. 8-R One-handle Ratchet, complete, \$12.75; No. 8-RX Two-handle Ratchet, complete, \$13.75; Extra Dies, any size, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ or 2 in. per set, \$0.85; Special Brass Pipe Dies, per set \$0.85. Beaver Dies fit all standard "4-post" tools.



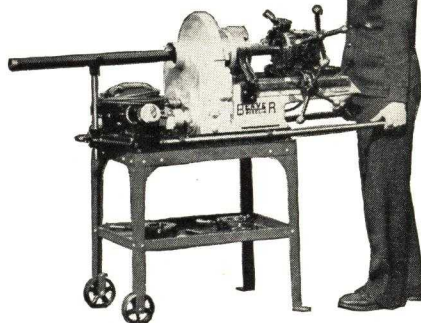
The Beaver Power Adapter

A practical one-man pipe machine—light in weight, simple, easy to understand, portable and low in price. Operated by any standard make of electric or air drill. The entire outfit, consisting of Beaver Power Adapter, Base and Die Heads, ($\frac{1}{2}$ to 2 in.) can be purchased for only \$86.80. The average $\frac{1}{2}$ -in. "Special" Electric Drill threads all sizes up to 2 in. $\frac{5}{8}$ -in. Heavy Duty Drill has sufficient power to drive geared tools for cutting and threading pipe up to 6 in. Cuts right or left hand threads, reversible for backing off. The whole outfit can be taken apart in thirty seconds and transported in the smallest automobile—and handled easily by one man. The units may be bought separately!

Net Prices—Adapter Unit, \$49.50 (including Driving "Spud" to fit electric drill chuck). Adapter Base, \$17.50. Beaver No. 17 Die Heads, complete with dies: $\frac{1}{2}$ in., \$2.80; $\frac{3}{4}$ in., \$3.00; 1 in., \$3.20; $1\frac{1}{4}$ in., \$3.40; $1\frac{1}{2}$ in., \$3.60; 2 in., \$3.80.

**"Model-A" Beaver Pipe Machine
 $\frac{1}{2}$ to 2 In.**

(Capacity up to 12 in. with Geared Tools)



Used three Self-Contained, fully adjustable, quick-opening die heads, each threading two sizes. Change die heads—not dies. $\frac{1}{4} \times \frac{3}{8}$ in. and $\frac{1}{2}$ in. heads available, extra. (See note * below.)

The cut-off device consists of a pair of spring-fed knives with a safety guide to control depth of cut and prevent "hogging" and knife-breakage. Automatic feed. An extension drive shaft is used to operate Geared Threaders and Cutters up to 12 in. This type of equipment offers many advantages at about one-third the cost of heavy, stationary pipe machines. Separate head available, extra, for holding standard 2-in. round bolt-dies, $\frac{1}{4}$ to 1 in.

Other Outstanding Advantages—Rack and Pinion Feed; Tilting Work Head; Swinging Blade-Reamer; Accessible Oil Pump; Outboard Pipe Support; Double-Jet Oil Flow; Aluminum Housings to minimize weight; Interchangeable Motor Unit; Easily Portable; Universal Motor (reversible) operates on any 110-volt a.c. or d.c. line, 25 to 60 cycle.

Net Prices—Model-A, complete, with three self-contained Die-Heads, threading $\frac{1}{2}$ to 2 in., and 5 gals. Beaver Threading Oil, \$345.00.

*Same with One Die-Head and three sets of dies— $\frac{1}{2} \times \frac{3}{4}$ in., $1 \times 1\frac{1}{4}$ in., $1\frac{1}{2} \times 2$ in., \$310.00. Portable Stand, extra, \$17.50. Extension Shaft, \$20.00. Die Heads, $\frac{1}{4} \times \frac{3}{8}$ in., or $\frac{1}{2}$ in., extra, each, \$20.00. Extra Dies, per set (each set threading two sizes), \$3.00. Bolt Die Holder, \$5.00. Bolt Dies, any size, $\frac{1}{4}$ to 1 in., \$1.95. Nipple Chucks, complete set of six $\frac{1}{2}$ to 2 in., \$6.00.

Write for Complete Catalog No. S-333

**No. 17 Beaver
Ratchet
 $\frac{1}{4}$ to 2 In.**

Rugged and fool-proof. Four large oil holes (bridged across top to prevent die spreading) facilitate oiling, provide ample chip clearance, and insure good threads. Die segments square in shape—no weak sections to break off. Buy any range of sizes.

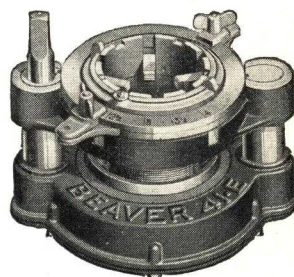
Net Prices—No. 17 complete, $\frac{1}{4}$ to 2 in., \$13.20; $\frac{1}{2}$ to 2 in., \$22.20; $\frac{1}{4}$ to 2 in., \$27.80.



**No. 41-E
Adjustable
Threader
 $2\frac{1}{2}$ to 4 In.**

Simple, rugged, semi-self-contained and adjustable. One set of dies threads all four sizes. Enclosed gears, packed with graphite grease, prevent damage to gear and pinion and save costly repair bills. Gear case of nickel semi-steel—which means greater rigidity, smoother and easier cutting, better threads, and less wear on dies and tool.

Net Prices—No. 41-E, $2\frac{1}{2}$ to 4 in., \$55.00; No. 61, $2\frac{1}{2}$ to 6 in., \$121.00; No. 80, $4\frac{1}{2}$ to 8 in., \$150.00; No. 90, 9 to 12 in., \$250.00.



Beaver Square-End Pipe Cutters

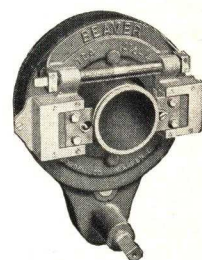
No. 1— $\frac{1}{8}$ to 1 in.; No. 5— $\frac{1}{2}$ to 2 in. Cut pipe square without burrs. Knives feed automatically.

Net Prices—No. 1, \$13.50; No. 5, \$15.00.

**No. 104 Square-End
Cutter
 $2\frac{1}{2}$ to 4 In.**

Self-contained. Gears encased and packed in grease. Unbreakable knives feed automatically. Universal two-jaw chuck centers and clamps tool on the pipe—no bushings. A "one-piece" tool.

Net Prices—No. 104, $2\frac{1}{2}$ to 4 in., \$62.50; No. 106, $2\frac{1}{2}$ to 6 in., \$114.00; No. 108, $4\frac{1}{2}$ to 8 in., \$144.00; No. 112, 9 to 12 in., \$194.00; No. 10, $2\frac{1}{2}$ to 4 in. (Ratchet—hand use only), \$60.00. Operating ratchet for Nos. 104, 106, 108, 112, extra, \$6.00.



**No. 102 Beaver Thin-Wheel Pipe Cutter
Range, $\frac{1}{8}$ to 2 In.**

The No. 102 Beaver can be used with either 1 or 3 wheels, and is guaranteed to "track" all of the time. Certified Malleable Iron insures against breakage. Patents pending.

Net Prices—No. 102 Beaver, \$3.00. (Wheels and Rollers are standard and interchangeable.)



THE TOLEDO PIPE THREADING MACHINE CO.

1425-1445 Summit Street, TOLEDO, OHIO

Pipe Tool Equipment

"Toledo" Pipe Tool Equipment consists of hand-operated pipe cutting and threading tools in various sizes up to and including 12 in. Complete "Toledo" catalogue on request.



Small Ratchet Pipe Threaders



"Toledo" No. 00 threads $\frac{1}{8}$ to $\frac{3}{4}$ -in. pipe; the No. 11 threads $\frac{1}{2}$ to $1\frac{1}{4}$ -in. pipe. Both tools are very efficient, operate easily, and reach corner jobs where other tools would be of no use. Instant change of dies, and smooth, perfectly tapered, standard threads produced.

No.	Capacity, in.	List price	Extra dies
00 complete.....	$\frac{1}{8}$ to $\frac{3}{4}$	\$19.00	\$2.00 per single set
11 complete.....	$\frac{1}{2}$ to $1\frac{1}{4}$	24.00	*2.00 per single set
12 complete.....	$\frac{1}{2}$ to 2	42.00	Prices on request

*Except 1 and $1\frac{1}{4}$ -in. dies, \$2.50 per single set.

One to Two-in. Pipe Threading Tools

"Toledo" One to Two-in. Threading Tools are made in eight models; Nos. 1 and 1A use separate set of dies for each size pipe; Nos. 10 and 10A, one set of dies for all four sizes from 1 to 2 in. Nos. 1 and 10 tools without ratchet; Nos. 1A and 10A with ratchet for close quarters. Operate easily and produce perfectly tapered, standard threads.

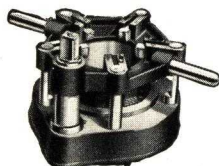
No.	Capacity, in.	List price	Extra dies
1 complete.....	1 to 2	\$24.00	\$2.50 per single set
1A complete.....	1 to 2	30.00	2.50 per single set
10 complete.....	1 to 2	28.00	2.75 per set
10A complete.....	1 to 2	34.00	2.75 per set

New Super Threaders without bushings. Broad-faced chuck jaws very easy to center on pipe. Excellent for brass, iron or steel pipe.

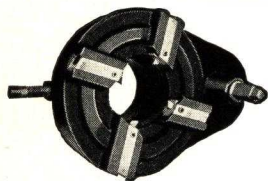
No.	Capacity, in.	List price	Extra dies
1B complete.....	1 to 2	\$30.00	\$2.50 per single set
1BR complete.....	1 to 2	37.50	2.50 per single set
10B complete.....	1 to 2	28.00	2.75 per set
10BR complete.....	1 to 2	34.00	2.75 per set

"Toledo" Geared Pipe Threaders

"Toledo" Geared Tools have no superior for threading the larger sizes of pipe. Made in five sizes as listed below. Each one strictly portable and operates so easily one man can cut the thread almost any place. May be connected to a "Toledo" Power Drive and converted into a swift, highly efficient power machine.



No.	Capacity, in.	List price	Extra dies
2.....	$2\frac{1}{2}$ to 4	\$100.00	\$ 8.00 per single set
$2\frac{1}{2}$	$4\frac{1}{2}$ to 6	200.00	12.00 per single set
25.....	$2\frac{1}{2}$ to 6	230.00	8.00 per single set
3.....	$4\frac{1}{2}$ to 8	300.00	12.00 per single set
4.....	9 to 12	500.00	20.00 per single set



"Toledo" Pipe Cutters

"Toledo" Pipe Cutters now made in six models of various capacities as listed below. The automatic pipe cutters are wonderfully efficient, fast, and positive in operation. The geared pipe cutters are known as exceedingly desirable cutters for large pipe.

Operated either by hand or "Toledo" Power Drives.

No. 40	2 to 4-in. automatic pipe cutter ..	\$ 60.00
No. 80	$4\frac{1}{2}$ to 8-in. automatic pipe cutter ..	150.00
No. 250	$2\frac{1}{2}$ to 6-in. geared pipe cutter ..	80.00
No. 300	$4\frac{1}{2}$ to 8-in. geared pipe cutter ..	105.00
No. 350	7 to 10-in. geared pipe cutter ..	130.00
No. 400	9 to 12-in. geared pipe cutter ..	150.00

"Toledo" Open-side Pipe Vises

Practical, convenient open-side vises. Excellent for making up fittings. Extra long handles and heavy frames. Very strong. Jaws easily replaced. Made in 3 sizes. Hold brass or copper, as well as iron or steel pipe.

No. 00 Vise, $\frac{1}{8}$ to $1\frac{1}{2}$ in. pipe. List price.....	\$ 4.75
No. 0 Vise, $\frac{1}{8}$ to $2\frac{1}{2}$ in. pipe. List price.....	6.00
No. 3 Vise, $\frac{1}{8}$ to $4\frac{1}{2}$ in. pipe. List price.....	14.00

"Toledo" Pipe Vises and Work Benches for pipe up to $4\frac{1}{2}$ in. Work benches with chain vise for pipe up to 18 in. Prices and information on request.



"Toledo" Power Drives

"Toledo" Power Drives convert hand-operated pipe cutting and threading tools into swift, highly efficient power machines. On

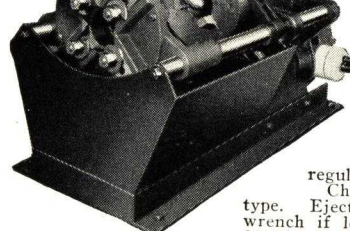
the market for many years and thousands are in use.



Power drive with 1 hp. d-c. or $1\frac{1}{2}$ hp. a-c., 60 or 50-cycle, single phase motor.....	Net price \$300.00
Power drive with $1\frac{1}{2}$ hp., 40, 30 or 25-cycle, single phase motor.....	Net price 350.00
Universal power drive with $\frac{1}{2}$ hp. Universal motor.....	Net price 250.00
"Super" power drive with $2\frac{1}{2}$ hp. a-c. motor.....	Net price 375.00

"Toledo" Portable Pipe Machine

No. 999 cuts, threads and reams $\frac{1}{2}$ to 2-in. pipe. An efficient small, compact, portable power pipe machine. One half hp. ball bearing Universal Motor operates from any 110 volt lamp socket. Very powerful, no gear shifting levers; centrifugal type oil pump is direct driven from motor.



Cutter head with four double edged blades fed by hand wheel cuts off pipe very rapidly. Two-inch pipe is cut off in 14 seconds and smaller sizes in proportion. Spindle and bearings are extra large; all gears run in oil. Direct gear drive and no chains or belts. Machine is protected by safety friction gear easily regulated by six cap screws.

Chuck is heavy three-jaw universal type. Ejector fingers positively eject chuck wrench if left in chuck. Net weight is but 296 lbs.

No. 999—With die heads $\frac{1}{2}$ to 2 ins., inclusive.....	Net price \$275.00
No. 999—With quick-opening die heads $\frac{1}{2}$ to 2 ins., inclusive.....	Net price 350.00

"Toledo" High Speed Power Pipe Machines

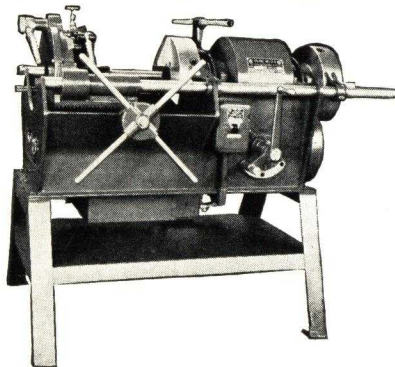
"Toledo" No. 1-2-4 is the fastest, easiest controlled, most productive 1 to 4-in. power pipe machine.

Eight quick-opening die heads—one for each size pipe—instant change. Cutter head with four knives cuts pipe off very rapidly and reaming is easily and quickly accomplished. Two three-jaw Universal Chucks are equipped with wrench throw-out fingers. Gears all run in oil. Six spindle speeds obtained with one clutch lever and gear shifting lever. All-steel frame is very strong. Machine is very durable.

Net weight is but 1750 lbs.

No. 1-2-4—Capacity, 1 to 4-in., inclusive. Complete with 3 hp., 220-440 volt, 3-phase, 60 cycle motor.

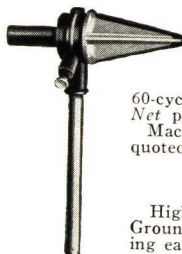
Net price.....\$1400.00



"Toledo" 2-in. High Speed Production Machine

It is also made in a $\frac{1}{2}$ to 2-in. model—exactly like the No. 1-2-4 except smaller. Very fast, efficient and easy to operate. $\frac{1}{2}$ -in. pipe cut off in 2 seconds. Threaded in 6 seconds. 2-in. pipe cut off in 3 seconds. Threaded in 13 seconds. Net weight is 800 lbs. 2-in. high speed machine—capacity $\frac{1}{2}$ to 2 in., inclusive. Complete with $1\frac{1}{2}$ hp. 220-440 volt, 3-phase, 60-cycle motor.

Net price.....\$750.00
Machines with motors of other current specifications quoted on request.



"Toledo" Ratchet Pipe Reamer

High speed steel cutter blades cast solidly in the head. Ground with proper clearance for each size of pipe, assuring easier cutting. Readily re-sharpened. Oversized ratchet parts are all enclosed, assuring long life.

Reamer complete. Capacity, $\frac{3}{8}$ to 3 in.
List price.....\$7.00

"Toledo" Junior Pipe Reamer

A small, compact and convenient all steel pipe or conduit reamer. One piece multiple tooth reamer head accurately ground. Readily resharpened when dull. Highly polished and unbreakable hand grip and handle. Junior pipe reamer, capacity $\frac{1}{8}$ to 2 ins. List price.....\$5.00

THE VAN DORN ELECTRIC TOOL CO.

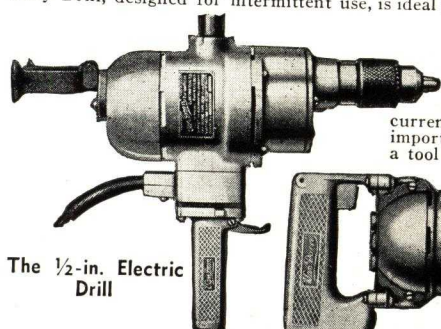
Portable Electric Tools

TOWSON, MARYLAND

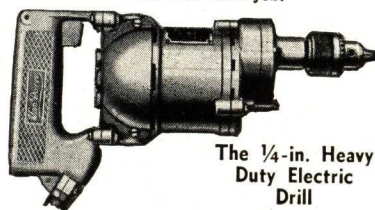
Van Dorn Electric Tools are carried in stock by the leading electrical, mill supply, machinery, plumbing, hardware, and automotive supply houses. Call your regular supply house on the 'phone.

Portable Electric Drills

In the complete list of Van Dorn Portable Electric Drills, you will find a unit for every purpose. Odd job drilling, continuous production service, maintenance operations—or for use in combination with Bench and Post Drill Stands as efficient Drill Presses. All units, except the $\frac{1}{4}$ -in. Light Duty Drill, are designed for continuous service. The $\frac{1}{4}$ -in. Light Duty Drill, designed for intermittent use, is ideal for the man who "goes out on the job." Universal motors increase the usefulness of the units, since any drill may be operated on alternating or direct current. This is particularly important to the man who takes a tool out on a job.



The $\frac{1}{2}$ -in. Electric Drill



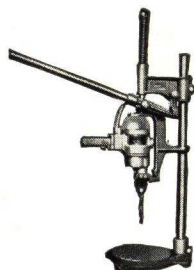
The $\frac{1}{4}$ -in. Heavy Duty Electric Drill

SPECIFICATIONS

Unit, ins.	Net weight, lbs.	No-load speed, r.p.m.	Price, all voltages
$\frac{1}{4}$ Light Duty.....	5	2000	\$28.00
$\frac{1}{4}$ Heavy Duty.....	5½	2000	38.00
$\frac{1}{2}$ Standard.....	15	540	53.00
$\frac{1}{2}$ Heavy Duty.....	16	550	65.00
$\frac{3}{8}$ Ball Bearing.....	22½	450	78.00
$\frac{3}{8}$ Ball Bearing.....	24½	375	85.00
$\frac{1}{2}$ Heavy Duty.....	22	375	90.00
1 Heavy Duty.....	26	350	106.00
Coal Drill (One-man).....	28	600	155.00

$\frac{1}{4}$ -in. Light and Heavy Duty, $\frac{1}{2}$ -in. Standard and Heavy Duty, and $\frac{5}{8}$ -in. Special—standard voltage, 110, other voltages, 32, 220, or 250, no extra charge.

$\frac{5}{8}$ and $\frac{3}{4}$ -in. Ball Bearing, $\frac{7}{8}$ and 1-in. Heavy Duty, and Coal Drill—standard voltage, 110, other voltages, 220 or 250, no extra charge.



Portable Drill Stands

These stands give a 6 to 1 leverage, enabling operator to exert tremendous pressure on work.

$\frac{1}{4}$ -in., $\frac{5}{8}$ -in. Bench Stand.....	\$12.00
$\frac{1}{2}$ -in. Bench Stand.....	22.00
$\frac{3}{8}$ -in. to $\frac{1}{2}$ -in. Heavy Duty.....	28.00
$\frac{3}{8}$ -in. to $\frac{1}{2}$ -in. Post Stand.....	32.00
$\frac{3}{8}$ -in. to $\frac{1}{2}$ -in. Pedestal Stand.....	38.00

Wire Wheel Brushes

For cleaning valves. Revolved by $\frac{1}{4}$ -in. Heavy Duty Drill.



No.	Diameter, ins.	Price
704*	4	\$1.50
706†	6	2.50
708†	8	3.50
710†	10	6.00
712†	12	8.00

Extra Arbor Hole Adaptors—per pair 20¢.

* $\frac{1}{4}$ -in. Brush furnished as standard with $\frac{1}{2}$ -in. Arbor Hole. Can also be furnished with $\frac{3}{8}$ -in. Arbor Hole, no extra charge.

†Arbor Hole Adaptors furnished for $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, 1¼, 1½, 1¾, 1½, 1¾-ins. Specify size wanted.

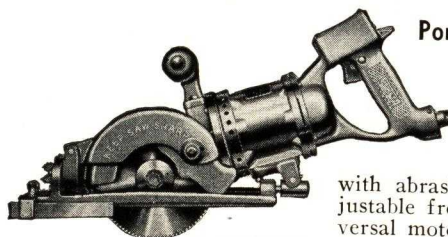
Hole Saws



Cut clean, round holes in metal or any material that can be cut with a hack saw. For use with $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ -in. drills. Made of finest quality tungsten steel, carefully hardened for durability.

Portable Electric Saws

For all types of construction work. Also useful for cutting marble, transite, asbestos, etc., with abrasive disc. Shoe adjustable from 0° to 45°. Universal motor.



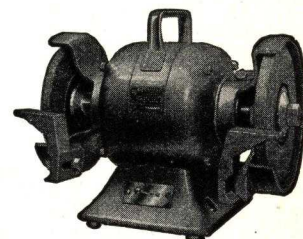
Size of saw, ins.	6	8	10
Diameter saw blades, ins.....	6	8	10
Depth of cut (adjustable), ins.....	1¾	2½	3½
No-load saw speed (r.p.m.).....	3000	2500	2000
Net weight (lb.).....	18¼	26	33¾
Price, all voltages.....	\$115.00	\$157.00	\$190.00

Standard voltage, 110. Other voltages, 220 or 250, no extra charge. 6-in. saw also furnished for 32 volts.

Portable Bench Grinders

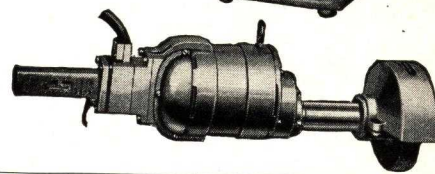
Made in three sizes for general grinding, buffing, tool sharpening, etc.

6-in. special (110V. a-c. only).....	\$28.00
6-in. ball bearing (110V. a-c. only).....	38.00
7-in. ball bearing (d-c. and single phase a-c. only).....	56.00
10-in. ball bearing (d-c. and single phase a-c. only).....	118.00



Aerial Grinders

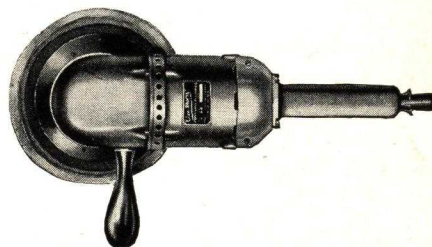
Made in three sizes—5, 6 and 10-ins. Ideal for portable grinding where considerable metal is to be removed, buffing, and wire wheel brushing.



5-in. Grinder, all voltages.....	\$ 80.00
6-in. Grinder, all voltages.....	100.00
10-in. Grinder, all voltages.....	150.00

Portable Electric Sanders

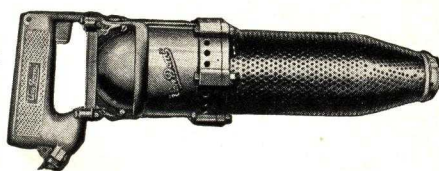
For sanding, grinding, cleaning and smoothing. Can be used with abrasive disc—from fine sandpaper to coarsest emery. Used widely for sanding metals before painting, cleaning, wire brushing, etc. Universal motors.



7-in. (straight type).....	\$68.00
7-in. heavy duty (right angle type).....	68.00
9-in. (straight type).....	88.00

Portable Electric Hammers

Particularly useful where any type of hammer action is necessary, such as drilling holes in concrete, stone, marble, etc. Also ideal for scaling paint, rust from boilers, etc. Universal motors.



	No. 2	No. 4	No. 6
Drilling capacity, ins.....	¾	1½	1½
Number of blows per minute.....	3300	2900	2900
Net weight, lb.....	10	16½	23
Overall length, ins.....	16½	19	20¾
Price, all voltages.....	\$125.00	\$175.00	\$225.00

Standard voltage, 110. Other voltages, 220 or 250, no extra charge.

CLIFFORD MANUFACTURING COMPANY

Manufacturers of "Hydron" Metallic Bellows

564 East First Street, BOSTON, MASS.

WESTERN SALES REPRESENTATIVE: F. B. Riley and Associates, DETROIT, MICH.

Products

SEAMLESS METALLIC BELLWS or SEAMLESS MULTIPLE DIAPHRAGMS, manufactured by a patented hydraulic process which insures a superior and uniform quality of product without additional cost. Bellows are used as control elements, as shaft packings, in thermostatically controlled valves, and in a variety of temperature and pressure control apparatus. Inquiries are invited on metallic bellows for all purposes.

Send for descriptive booklet.

Clifford Hydraulic Method of Forming

"Hydron" bellows are formed from thin wall metal tubing of the highest grade, specially developed for this purpose. The bellows have exceptional life characteristics, due to the automatic testing of the tube wall in the hydraulic forming and to the freedom from rubbing or frictional tool engagement with the thin metal wall during the formative operation. The hydraulic process achieves a remarkable uniformity and quality of product.

Methods of Finishing

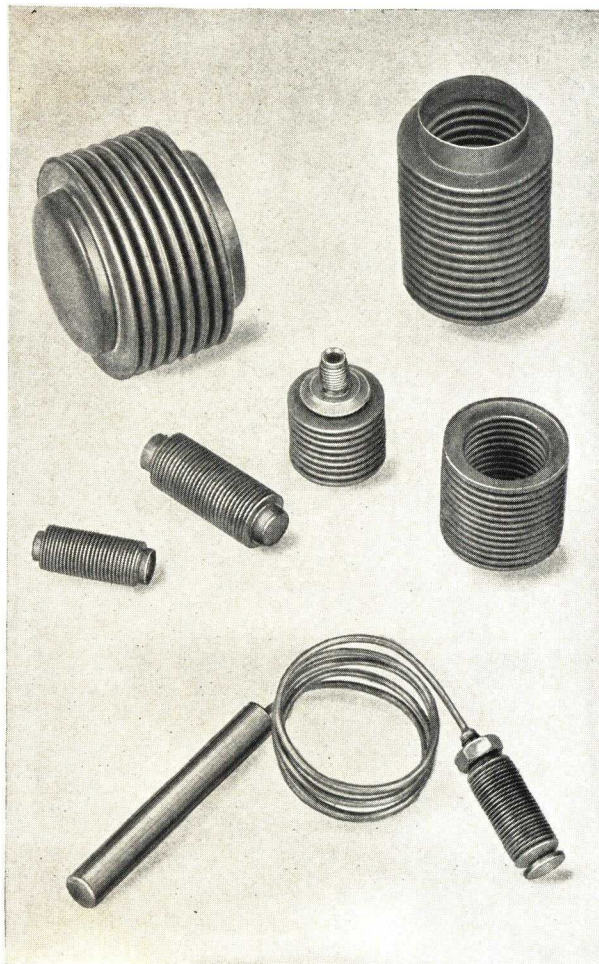
The illustrations indicate a few sizes and methods of finishing. The bellows may be formed with the closed end of the tubing left intact. End fittings may be attached to the bellows before the hydraulic forming operation, pretesting the soldered joints and making possible the use of a fitting considerably smaller in outside diameter. The bellows can be furnished with any desired form of end fitting or as an open-ended product with spun flanges designed for attachment of end fittings by the customer.

Complete bellows assemblies of all types are furnished filled and sealed for thermostatic operation.

Illustration shows smallest size, $\frac{1}{8}$ -in. outside diameter bellows, with capillary tubing and attached bulb filled, sealed and ready for assembly to valve or switch.

Sizes

"Hydron" bellows are made in a wide range of commercial sizes and wall thicknesses as indicated in the table below.



"HYDRON" METALLIC BELLWS

Dimensional data						Flexibility		Recommended max. working pressure, lb. per sq. in.	
Outside diameter, in.*	Inside diameter, in.	Effective area, sq. in.	Wall thickness, in.	Number of Maximum convolutions	Normal free length, in.	Maximum deflection, in.	Travel per lb. per sq. in., in. §	Internal	External
$\frac{9}{16}$	$\frac{3}{8}$	.172	.005	26	$1\frac{3}{16}$	$\frac{3}{32}$	.003	350	500
$\frac{3}{4}$	$\frac{1}{2}$	.306	.005	28	$1\frac{3}{8}$	$\frac{5}{16}$	.010	100	125
$1\frac{1}{8}$	$\frac{3}{4}$	.690	.005	11	$1\frac{1}{8}$	$\frac{3}{8}$	.030	60	75
$1\frac{1}{8}$ †	$\frac{3}{4}$	.690	.005	24	$2\frac{1}{16}$	$\frac{3}{8}$	.065	60	75
$1\frac{1}{8}$	$\frac{3}{4}$	.690	.006	11	$1\frac{1}{8}$	$\frac{5}{16}$	.020	90	120
$1\frac{1}{8}$	$\frac{3}{4}$	.690	.007	11	$1\frac{1}{8}$	$\frac{3}{16}$	.010	150	200
$1\frac{5}{8}$	$\frac{7}{8}$	.936	.006	11	$1\frac{1}{4}$	$\frac{1}{2}$	.040	75	100
$1\frac{5}{8}$	$\frac{7}{8}$	.936	.007	11	$1\frac{1}{4}$	$\frac{5}{16}$	.030	100	150
$1\frac{1}{2}$	1	1.227	.005	12	$1\frac{1}{2}$	$\frac{1}{2}$	.075	40	55
$1\frac{1}{2}$	1	1.227	.006	12	$1\frac{1}{2}$	$\frac{3}{8}$	.062	60	80
$1\frac{1}{2}$	1	1.227	.008	12	$1\frac{1}{2}$	$\frac{5}{8}$	.050	100	150
$1\frac{1}{2}$	1	1.227	.009	12	$1\frac{1}{2}$	$\frac{3}{4}$	.035	125	175
2	$1\frac{3}{8}$	2.236	.006	16	$2\frac{1}{16}$	$\frac{1}{2}$	.200	40	60
2	$1\frac{3}{8}$	2.236	.008	16	$2\frac{1}{8}$	$\frac{5}{8}$	.160	50	70
2	$1\frac{3}{8}$	2.236	.011	5	$1\frac{1}{8}$	$\frac{1}{2}$	.020	150	200
$2\frac{7}{16}$	1.600	3.191	.005	7	$2\frac{1}{4}$	$\frac{1}{2}$	.195	20	30
$2\frac{7}{16}$	1.600	3.191	.008	13	$2\frac{1}{4}$	$\frac{3}{4}$	.270	40	65
3	$2\frac{9}{16}$	5.157	.006	8	$3\frac{1}{4}$	$\frac{3}{4}$	.250	40	65
3	$2\frac{9}{16}$	5.157	.008	8	$3\frac{1}{4}$	$\frac{1}{2}$	.160	60	80
$4\frac{1}{2}$	3	10.680	.008	13	$3\frac{1}{4}$	$1\frac{1}{4}$	1.250	18-50	20

*Outside diameters listed above may be decreased but cannot be increased. Inside diameters are fixed.

†Not available with closed end of tube.

§Applies to either pressure or vacuum.

Note: The maximum pressures in the above table are the absolute maximums which the bellows will withstand under certain conditions particularly involving mechanical operation. Where the bellows are to operate thermostatically the working pressures will be somewhat less. In this connection we once more suggest detailed explanation of the particular adaptation.

The above bellows may be furnished with multiply construction and, in a number of cases, this type is being manufactured in production.

Special bellows having unusual characteristics will be made to the customer's specifications.

Super-flexible bellows particularly adapted to instrument purposes because of their extreme flexibility are being manufactured to meet such requirements as operation on pressure changes of less than 1 in. of water.

SCOVILL MANUFACTURING COMPANY

WATERBURY, CONN.

BOSTON
DETROIT

PROVIDENCE
CHICAGO

NEW YORK
CINCINNATI

PHILADELPHIA
SAN FRANCISCO

ATLANTA
LOS ANGELES

SYRACUSE
IN EUROPE—THE HAGUE, HOLLAND

Products

BRASS, BRONZE and NICKEL SILVER MILL PRODUCTS. CUP-DRAWN ADMIRALTY, SEAMLESS MUNTZ and "ALCUNIC" CONDENSER TUBING. BRASS and COPPER PIPE. CAP and MACHINE SCREWS, SCREW MACHINE PRODUCTS. Fabricated metal parts and complete articles of every description made to order.



Mill Products

Sheet—With over seventy standard alloys and a long list of alloys developed for special purposes, Scovill has a metal to meet practically any requirement for a copper alloy. The metal is available in coils or sheets, drawn rods, extruded shapes, tubing and wire. Sheet metal can be furnished patent leveled where desired. This material can be furnished in all gauges and tempers for manufacturing operations such as stamping, drawing, spinning, etc.

Scovill High Speed Brass Rod—A very free cutting leaded brass rod for high speed production on automatic screw machines. It is free from hard spots and uniform both as to size and temper. Where long tool life, accuracy of product and high speed production are important this rod will be found ideal. A representative from any of the offices listed above will be glad to further explain its possibilities to you.

Rod—Scovill rods are available extruded and drawn in round, square, rectangular, hexagonal and special shapes. In many cases surprising economies can be effected through the use of shaped extruded rod to replace machined sections.

Wire—Wire from the Scovill mills furnished in various alloys and a variety of shapes is used in the manufacture of screws and rivets, common and safety pins, springs of all types and shapes, Fourdrinier screens for paper making, wire screens for filtration purposes and a long list of other products. Whether there is a color to be matched, a temper to be duplicated or an unusual condition to be met, Scovill engineers can specify a material to meet the requirements precisely.

Tubing—Scovill seamless drawn commercial tubing is made in several alloys and in sizes from $\frac{1}{8}$ -in. to $3\frac{1}{2}$ -in. diameters with practically any wall thickness required. Scovill tubing has a smooth even surface and will be found very satisfactory for fabrication or other manufacturing purposes.

Condenser Tubing

The Scovill Engineering Department has a special section giving particular attention to condenser tube problems. Over a period of several years' specialization in this field a fund of information of considerable value has been accumulated in overcoming condenser tube troubles. When so requested this department will gladly work with your engineers toward the solution of any condenser tube problems you may be facing. Write to the Waterbury office for this service.

Cup-drawn Admiralty—Where operating conditions are severe and the circulating water is either fresh or salt water polluted with acid, mine wastes or sewage, Scovill Cup-drawn Admiralty Condenser Tubing has a

satisfactory life. Made by the cup-drawn process it is free from internal flaws, has a smooth clean polished surface both inside and out and a uniform fine grain structure. It has a high resistance to corrosion. Scovill Cup-drawn Admiralty tubing is also very satisfactory for heat exchanger service.

Seamless Muntz—Where uncontaminated fresh water is used for circulation, Scovill Seamless Muntz Condenser Tubing has a very satisfactory life and is the most economical material for use in such conditions.

"Alcunic"—"Alcunic" Condenser Tubing should be specified where the operating conditions are very severe. "Alcunic" is an aluminum, copper, nickel alloy with a remarkable resistance to corrosion even at elevated temperatures, and a very high resistance to air impingement attack. Our engineering department will gladly work with you toward the possible application of this material to increase your condenser tube life.

Screw Products

Cap Screws—Scovill cap screws in brass and steel with hexagon fillister, flat or button heads are made to the American Standard Specifications. The heads are uniform in size and finely finished. Their unusually high and uniform tensile strength provides a surplus strength above any strain they will ever encounter in actual service. Large stocks are maintained at Waterbury, Chicago, Cincinnati and San Francisco.

Special Screws—We have complete facilities for reheating, clipping, drawing, drilling cross holes, and machining bodies to requirements both on cap and machine screws. Improvements in methods of manufacture have made it possible to produce screws of special shape which will replace expensive screws previously possible only by casting and machining. We have very complete facilities for handling this type of work.

Screw Machine Products—Scovill can handle orders for practically any quantity of screw machine products in any size from the very smallest up to products made from $1\frac{1}{2}$ -in. diameter rod. Turned from Scovill High Speed Brass Rod or any other non-ferrous or ferrous material they can be furnished to very close limits of accuracy.

Manufactured Goods

Scovill offers a complete manufacturing service for the production of finished metal articles packed for shipment to the consumer or partially fabricated products ready for further mechanical operation. In many cases the Scovill-made parts are combined with other parts made by the customer and the whole assembled to make the complete product. Practically any desired combination of operations and finishing methods is available.

If you require parts or products made from brass, bronze, nickel-silver, steel, zinc, aluminum or other metals, either finished, packed ready for sale or in a semi-finished state, Scovill can handle this work for you both economically and effectively. A representative from any of the offices listed above will be glad to further explain the possibilities of this method for economical manufacturing.

SHAKEPROOF LOCK WASHER CO.

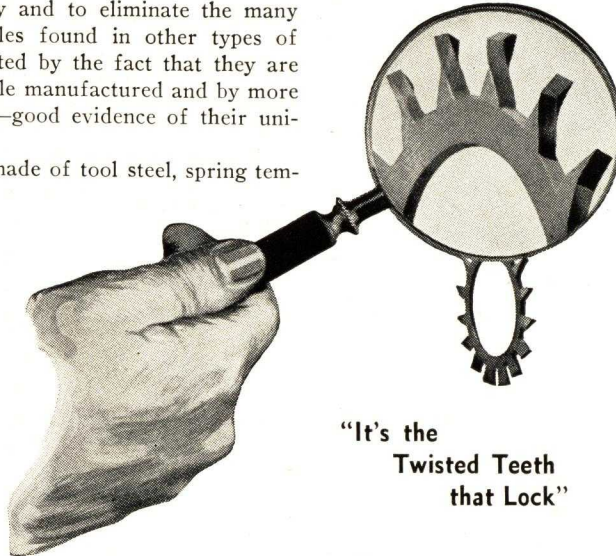
Manufacturers of Lock Washers and Locking Terminals

2503 North Keeler Avenue
CHICAGO, ILL.

SHAKEPROOF LOCK WASHERS

Designed to lock nuts positively and to eliminate the many mechanical and production troubles found in other types of washers. Their efficiency is attested by the fact that they are used on practically every automobile manufactured and by more than 150 other types of industry—good evidence of their universal application and success.

Shakeproof Lock Washers are made of tool steel, spring tempered. Twisted teeth, evenly spaced around the entire washer, act similar to that of ratchet pawls, permitting movement in one direction and resisting any movement in the reverse direction. Vibration imbeds these spring steel twisted teeth in both nut and work surface, thus vibration adds to the holding power of Shakeproof Lock Washers. Made in a circle (no split) the spring of each twisted tooth is distributed equally



"It's the
Twisted Teeth
that Lock"

around the entire nut thus affording utilization of entire bolt head or nut surfaces.

Shakeproof Lock Washers are *tangleproof* and *spreadproof*! These features alone have saved many manufacturers a countless amount of time in assembly. They are easily and rapidly applied; their lighter weight saves in shipping costs and permits the use of shorter bolts.

Shakeproof Lock Washers are made in sizes to cover practically every application in industry—Steel and Bronze in any standard finish.

Make a test of these facts in your own shop. We will gladly send, upon request, as many washers as you need in any size.



Type 11 External Tooth

Made with twisted teeth on the outside circumference for use with U. S. Standard Bolts and Nuts.

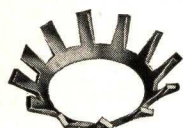
Stock No.	Screw or bolt size	Dimensions		
		O.D.	Thickness	Code
1104	No. 4	$\frac{3}{8}$	.018	Abandon
1106	No. 6 and $\frac{1}{8}$	$\frac{7}{8}$	.018	Abess
1108	No. 8 and $\frac{3}{8}$	$\frac{3}{4}$	.021	Abbott
1110	No. 10 and $\frac{1}{2}$	$\frac{1}{2}$	.024	Abdal
1114	$\frac{1}{4}$	$\frac{1}{2}$	.030	Abduct
1118	$\frac{5}{16}$	$\frac{3}{4}$	.035	Abeam
1120	$\frac{3}{8}$	$\frac{1}{2}$	.035	Abel
1122	$\frac{7}{8}$	$\frac{3}{4}$	.040	Aberr
1124	$\frac{1}{2}$	$\frac{7}{8}$	.040	Abhor
1126	$\frac{5}{8}$	$\frac{3}{4}$	.040	Ability
1128	$\frac{5}{8}$	$1\frac{1}{8}$	.050	Abrupt
1132	$\frac{3}{4}$	$1\frac{1}{4}$	.050	Absent
1134	$\frac{7}{8}$	$1\frac{1}{2}$	.062	Abstain
1136	1	$1\frac{5}{8}$	.062	Absorb

Type 12 Internal Tooth

With twisted teeth on the inside of washer. For use with S.A.E. bolts and nuts, standard machine screws.



Stock No.	Screw or bolt size	Dimensions		
		O.D.	Thickness	Code
1202	No. 2	$\frac{1}{2}$	.010	Bate
1203	No. 3	$\frac{3}{4}$	.012	Bend
1204	No. 4	$\frac{1}{2}$	.014	Bay
1206	No. 6 and $\frac{1}{8}$	$\frac{3}{4}$	.018	Bark
1208	No. 8 and $\frac{3}{8}$	$\frac{1}{2}$	.018	Bank
1210	No. 10 and $\frac{1}{2}$	$\frac{1}{2}$	.021	Bayou
1212	No. 12	$\frac{3}{4}$	.021	Bow
1214	$\frac{1}{4}$	$\frac{1}{2}$	.024	Bead
1218	$\frac{5}{16}$	$\frac{3}{4}$	.030	Beak
1220	$\frac{3}{8}$	$\frac{1}{2}$	.035	Bear
1222	$\frac{7}{8}$	$\frac{3}{4}$	.035	Beast
1224	$\frac{1}{2}$	$\frac{7}{8}$	.040	Beaver
1226	$\frac{5}{8}$	$\frac{3}{4}$	.040	Beck
1228	$\frac{5}{8}$	$1\frac{1}{8}$	.045	Bed
1232	$\frac{3}{4}$	$1\frac{1}{2}$	.050	Beef
1234	$\frac{7}{8}$	$1\frac{3}{8}$	.050	Bean
1236	1	$1\frac{5}{8}$	.062	Best



Type 15 Countersunk

For flat and oval head screws. Fits under head crown shape.

Stock No.	Screw or bolt size	Dimensions		
		O.D.	Thickness	Code
1506	No. 6 and $\frac{1}{8}$	$\frac{1}{2}$	.016	Heap
1508	No. 8 and $\frac{3}{8}$	$\frac{3}{4}$	.018	Health
1510	No. 10 and $\frac{1}{2}$	$\frac{1}{2}$	.021	Hear
1512	No. 12	$\frac{3}{4}$	.021	Heart
1514	$\frac{1}{4}$	$\frac{1}{2}$	.021	Heat
1516	No. 16	$\frac{3}{4}$	.024	Head
1518	$\frac{5}{8}$	$\frac{1}{2}$	.028	Heal
1520	$\frac{3}{8}$	$\frac{3}{4}$	.030	Hide

Shakeproof Locking Terminals

One of the many adaptations of the Shakeproof locking principle. In radio and electrical parts, where tight connections are necessary for positive contact, Shakeproof Locking Terminals are being used by practically every manufacturer. Shakeproof's twisted teeth bite in, thus eliminating all troubles experienced from loose terminals. We can supply over fifty stock types for all standard size holes. Write for catalog and samples.



Types of Terminals

Adaptation of Shakeproof Principle

The Shakeproof principle can be adapted to any locking problem. Submit your problems to our engineers and we will gladly make recommendations without obligation. We are also equipped to produce metal stampings, including spring washers and tension washers of special design.

UDYLITE PROCESS COMPANY

MAIN OFFICE

3947 Bellevue Avenue, DETROIT, MICH.

BRANCH OFFICES

CHICAGO, ILL., 205 Wacker Drive

NEW YORK, N. Y., 30 E. 42nd Street

SAN FRANCISCO, CALIF., 114 Sansome Street

The Udylite Process

The UDYLITE PROCESS COMPANY is a pioneer in the application of metallic cadmium, electrolytically deposited, to the surfaces of metal parts for the purpose of rust prevention. The word "Udylite" is the registered trade-mark name. To give a brief picture of the method of rust proofing, the part to be processed is immersed in a special cadmium cyanide solution and is made the cathode or negative pole in an electric circuit. Upon the passage of electric current through the solution, cadmium is deposited on the part. A thin cadmium plate applied by the Udylite method, enjoys a high reputation for rust prevention in industry.

Service

As the only concern with a separate service department, marketing a cadmium plating process, we are prepared to service the solutions of our licensees at all times. Our staff of service men consists of technically trained chemical engineers who have become specialists, through years of experience, in the application of electrolytic cadmium for rust prevention.

The service program calls for periodic visits to the plants of our licensees at which time, advice is given as to control and maintenance of the plating solution for maximum quality production. This service is rendered *free of charge* to users of our process.

Laboratory Facilities

In keeping with its progressive policy, the UDYLITE PROCESS COMPANY maintains a separate chemical control and research department under the guidance of one of the foremost authorities on rust prevention in the country.

The control department takes care of the testing of Udylite solutions. Samples of solution are regularly sent in for analysis by users of the Udylite process and recommendations for maximum efficiency are made based on the results of these tests. This regular analysis of plating solution is another service which is rendered free of charge to users of our process.

Included in the research division is the experimental plating laboratory. This is the largest and best equipped of its kind in the world. In this laboratory, the prospective user of Udylite may see his product rust proofed with cadmium under actual plant operating conditions. Over thirty experimental tanks together with auxiliary apparatus such as rheostats, voltmeters, ammeters, etc., are housed in this laboratory. To this laboratory belongs special rooms for sandblasting and lacquering.

Applications

As the most efficient means of preventing rust and corrosion, Udylite cadmium has an almost universal application. However, a few of the more important fields in which it has proven successful are listed as follows:

1. Radio
2. Automobile
3. Aircraft
4. Architectural (Parts that come in contact with concrete, terracotta, etc.)
5. Screw Machine Products (Bolts, nuts, washers, etc.)
6. Washing Machine Parts (Parts contacting alkaline soaps)
7. Electrical Products (Knife switches, switch boxes, etc.)
8. Marine Hardware Parts
9. Wire Products, such as springs, screening, nails, etc.
10. Hardware articles, such as lawn mower parts, wrenches, small tools
11. Cans and Containers

The Protective Qualities of Cadmium

Cadmium is the only metal which presents a suitable combination of the necessary properties for effective rust prevention. By means of the Udylite Process it can be applied evenly as a very dense and non-porous coating on articles of all shapes and forms. Its favorable mechanical and chemical properties make for a long life of the coating itself. Cadmium is anodic to iron and therefore must corrode before the iron is attacked.



The combination iron-cadmium, however, produces only a very small electromotive force, so while it protects iron, the tendency to corrode from this cause is very small. It is found that under ordinary atmospheric conditions, a cadmium coating applied by the Udylite Process needs to be only one-third to one-fifth as thick as other coatings to give the same protection.

In connection with the above it may be interesting to note here that the United States Government specifications call for a 3/10000-in. coating of cadmium as compared to a 1/1000-in. coating of zinc on nonferrous metal parts. The Udylite Company is proud to state that today it lists twenty-six government installations among its customers.

Some Characteristics of Cadmium

The chemical behavior of cadmium is quite similar to that of zinc except that it does not form basic salts as readily as zinc and will therefore retain its lustre for a longer period of time.

While strong alkalis cause considerable darkening of the cadmium coating, weak alkalis have hardly any effect at all. Zinc plate is readily soluble in all alkaline solutions. Thus, for example, cadmium is used on soap making machinery, washing machines, scrubbing brushes, etc.

While preventing corrosion cadmium does not increase the electrical contact resistance, in fact, it has an opposite effect in eliminating copper sulfide or verdigris and giving cleaner and better contacts.

Cadmium is very ductile and malleable at ordinary temperature. This quality is particularly valuable in preventing the coating from cracking, when the base metal is subjected to distortion.

Cadmium has a relatively high electrical conductivity, the specific resistance being 6.2 microhms per centimeter cube, and it is diamagnetic. It is therefore used on very delicate instruments without interfering in any way with the electrical and magnetic properties and the functioning of any electrical devices.

Cadmium when applied by the Udylite Process has a bright silvery color and retains its brilliancy for a surprisingly long time in an ordinary room atmosphere.

Simplicity of Application

In 1919, the Udylite Process was applied only with great difficulty and within such exacting ranges that only a chemical engineer was qualified to have charge of the process. Today, such improvements have been made that any plater can readily grasp the essentials, and will need no instructions other than those given when the equipment is installed.

In order that maximum results may be derived from a plating solution, modern methods of plating demand chemical control of that solution. Realizing this, the Udylite Process Company devised simple means of checking the three essential factors for good plating results: (1) The metal content of the bath. (2) The free cyanide content of the bath. (3) The amount of metal deposited on the plated object.

With this information at his disposal, even an inexperienced plater will be able to produce a perfect Udylite plate.

Economy of Rust Proofing

For ordinary purposes a coating of only .0002 inch of cadmium is required which, as described previously, is much thinner than for any other rust proofing coating. The cost of this coating for cadmium alone is approximately 1/2 cent per square foot. As a Udylite coating is much thinner than other rust proofing coatings, and as cadmium is electro deposited about twice as fast as either nickel or zinc, a tank of Udylite solution will produce many times as much work in a given time as the same tank operated with nickel or zinc solutions. The labor costs, depreciation, overhead, etc., are proportionately lower. It is only natural, therefore, that the Udylite Licensee should effect great savings.

THE AMERICAN BRASS COMPANY

WATERBURY, CONNECTICUT

OFFICES AND AGENCIES IN PRINCIPAL CITIES

MANUFACTURING PLANTS

ANSONIA, CONN.
BUFFALO, N. Y.

DETROIT, MICH.
KENOSHA, WIS.

TORRINGTON, CONN.
WATERBURY, CONN.

CANADIAN MILL: Anaconda American Brass Limited, NEW TORONTO, ONTARIO

Products

COPPER and copper alloyed with zinc, tin and nickel in all combinations which can be wrought into SHEETS, WIRE, RODS and TUBES.



Technical Department

The services of an efficient Technical Department, the knowledge and experience of which is based on over a century of brass manufacturing, is available to engineers and others interested in metallurgical problems.

Special Alloys for Engineering Purposes

Ambrac Metal, Everdur, Cupro Nickel, Nickel Silver, Tobin Bronze, Phosphor Bronze, Manganese Bronze, Aluminum Bronze and many other special alloys are supplied in the form of sheets, wire, rods and tubes for special engineering purposes.

Ambrac Metal

(Trade Mark Reg. U. S. Pat. Off.)

Ambrac is a special white metal alloy which combines the properties of high strength and remarkable resistance to corrosion and erosion. It has been perfected after years of metallurgical research and technical experimentation, to fill a real manufacturing need.

Ambrac Metal is furnished in the forms of sheets, wire, rods tubes, and ingots. It is successfully used for pump plungers and linings, valves, screens, cooking vats, condenser tubes operated at high temperatures, evaporators, sterilizers and many similar purposes.

Anaconda Phosphor Bronze

Anaconda Phosphor Bronze is a general term assigned to copper-tin alloys from which the oxides have been eliminated by the addition of phosphorus. The component parts when correctly adjusted produce a fine grained, homogeneous metal which possesses high tensile strength, high elastic limit, high resistance to fatigue, high resistance to corrosion, low coefficient of friction and high resistance to wear by friction.

Because of these properties Anaconda Phosphor Bronze is extensively used for purposes requiring a non-corrosive metal which successfully resists abrasion and retains its high elasticity under repeated bendings.

Physical Properties—In general the properties of Anaconda Phosphor Bronze are as follows:

- (1) *High tensile strength*—Up to 130,000 lb. per sq. in. for standard materials, depending upon the alloy and temper.
- (2) *High elastic limit*—Up to 90,000 lb. per sq. in. for standard materials, depending upon the alloy and temper.
- (3) *High resistance to fatigue*—An 8% tin alloy under fibre stress of 37,600 lb. withstood 117,000,000 reversals before breaking.
- (4) *Low coefficient of friction.*
- (5) *High resistance to corrosion and freedom from season cracking.*
- (6) *Minimum risk of sparking.*

Grades—Anaconda Phosphor Bronze is furnished in six alloys which are designated as grades "A," "B," "C," "D," "E" and "Special" which vary in the proportions of tin and phosphorous contents and consequently differ in physical properties

and **machinability**. Anaconda "Special" Phosphor Bronze is a true phosphor bronze with genuine free-cutting qualities. It can be machined at speeds approximating those used with leaded yellow brass.

Practically all grades are obtainable in the form of sheets, tubes, rods and wire. Detailed information is contained in Anaconda Publication B-15.

Anaconda Beryllium Copper

Anaconda Beryllium Copper is a new alloy possessing excellent physical properties *which may be greatly increased by heat treatment*. The principal physical advantages of this alloy are high tensile strength, high fatigue limit and hardness. Its electrical and thermal conductivity are relatively high, depending upon the heat treatment it receives, and its resistance to corrosion is comparable to that of copper.

Composition—Tests made by THE AMERICAN BRASS COMPANY have led to standardization upon an alloy containing 2.25% beryllium and the balance copper. The 2.25% alloy provides nearly maximum physical properties obtainable in an alloy suitable for cold working, and also permits the further adjustment of these characteristics through annealing, cold working and heat treating.

Fatigue Resistance—A Beryllium Copper circuit breaker spring, under endurance test and carrying electric current, compressed at an approximate rate of 25 times per second, underwent 10,000,000 cycles of operation at the time of report, with no sign of failure. A manufacturer requiring spring material which could be stressed to 35,000 p.s.i., bending at a frequency of 100 cycles per second, found that Beryllium Copper followed these specifications more closely than any other material tested.

Electrical Conductivity—The electrical conductivity of Beryllium Copper is high compared with that of steel, phosphor bronze and other high-strength materials, although it is considerably lower than that of pure copper. An interesting feature of this alloy is that the same heat treatment which improves the physical properties so remarkably, also serves to increase the electrical conductivity.

Machinability—One of the outstanding advantages of Beryllium Copper is its machinability, which compares favorably with that of other high-strength metals. While it cannot be classified as free cutting, it is not difficult to machine.

Applications—Beryllium Copper is being used in such widely diversified applications as machined valve guides and forged clutch plates for airplanes, oil burner tips, plug clips for electrical appliances, revolver firing pins, watch cases, contact fingers for dimming rheostats, toggle detail in snap switch, bourdon tubes and coil springs.

Forms Available—For the present, the production of Anaconda Beryllium Copper is confined to sheets, strips, rods, wire and tubes in the sizes and gauges in which Phosphor Bronze is ordinarily furnished. It is also available in the form of die-pressed forgings within certain manufacturing limitations. For further general information on Beryllium Copper, ask for a copy of Anaconda Publication B-21. Requests for specific information should be referred to Department "B," Waterbury, Conn.

Tobin Bronze

(Trade Mark Reg. U. S. Pat. Off.)

Tobin Bronze is manufactured solely by THE AMERICAN BRASS COMPANY. It combines elasticity, toughness and uniformity of texture with resistance to corrosion, which makes it adaptable for a great variety of engineering uses, especially where the material is exposed to the corrosive action of salt water.

Tobin Bronze is furnished in round, square, hexagonal and octagonal rods and special shapes for studs, bolts, forgings, etc., turned and straightened pump piston rods and yacht shafting; hot rolled sheets for yacht plates, fin keels and underwater parts; circles for condenser head plates. Tobin Bronze can be forged, stamped and drop-forged in the same manner as steel.

Everdur

(Trade Mark Reg. U. S. Pat. Off.)

Everdur is an alloy of copper, silicon and manganese. Attention is called to the strength and high physical qualities of the metal, which make it possible to replace steel used under corrosive conditions with Everdur to engineering advantage and with ultimate economy.

Everdur Metal is manufactured by THE AMERICAN BRASS COMPANY in the form of plates, sheets, rods, wire, pipe, hot pressed parts, forging blanks, casting ingots and welding rods. Arrangements have been made with fabricators to furnish Everdur castings, pipe fittings, bolts, nuts, screws, rivets, nails, woven wire, etc.

Anaconda Publication E-2, containing further information in regard to the physical properties and uses of Everdur, will be sent upon request.

Tubes for Engineering Purposes

The manufacturing facilities of THE AMERICAN BRASS COMPANY include equipment for the production of seamless tubes in sizes up to 26-in. outside diameter in a wide range of alloys.

Anaconda Condenser Tubes—Anaconda Condenser Tubes are manufactured in all standard sizes of the following alloys:

Super-Nickel (70% Copper/30% Nickel), Ambrac "A" (75% Copper/20% Nickel/5% Zinc), Aluminum Bronze (95% Copper/5% Aluminum), Aluminum Brass (76% Copper/22% Zinc/2% Tin), Admiralty Alloy and Muntz Metal.

For Severe Service—Anaconda Super-Nickel and Ambrac Tubes are recommended for marine and stationary condensers operating under unusually severe conditions. Actual experience during the past ten years substantiates the conclusions of metallurgists that high nickel alloys provide the best resistance to wear and corrosion and possess the necessary heat conductivity and strength to meet all condenser requirements. More than 300 vessels are now equipped with high-nickel alloy tubes and numerous installations have been made in land installations.

Anaconda Super-Nickel, Ambrac, Aluminum Brass and Aluminum Bronze Condenser Tubes are now produced by an extrusion process which makes possible a better finish and physical structure than is obtainable by either drawn cup or cast shell methods. Further information on request.

Anaconda Deoxidized Copper Tubes—Anaconda Copper Tubes are especially deoxidized to eliminate the cuprous oxide so detrimental to the service life of tubing, and to withstand the severe operating conditions encountered in the refining of sugar and similar processes.

Anaconda Brass Pipe

THE AMERICAN BRASS COMPANY manufactures two grades of pipe—one of which is trade-marked Anaconda 67 and the other Anaconda 85. The first mentioned grade (67) is made from a high quality yellow metal alloy and is suitable for conveying water where the corrosive conditions are normal. The "85" pipe, also known as Red-Brass pipe, has been proven by extensive laboratory research and practical demonstrations to be the highest quality corrosion-resisting pipe commercially obtainable.

Sheets and Strips for Engineering Purposes

THE AMERICAN BRASS COMPANY specializes in the manufacture of engineering alloys and maintains extensive facilities for producing Copper, Brass, Bronze and Nickel Silver sheets, rolls, strips, circles, blanks and segments in all commercial sizes, gauges and tempers suitable for manufacturing operations, such as stamping, spinning, cupping, etc.

Anaconda Electro-Sheet—Sheet copper (plain) produced in wide widths and thin gauges.

Copper-Flex—(Fabric-backed Anaconda Electro-Sheet) now offered by THE AMERICAN BRASS COMPANY for industrial and general building purposes. Detailed information upon request.

Rods and Bars for Engineering Purposes

Anaconda Rods and Bars are extruded, rolled or drawn in round, square, hexagonal, rectangular and special shapes from a complete line of copper and copper alloys, as well as the special alloys previously described.

Anaconda Free Turning Brass Rods—Special attention has been given the development of leaded brass rods for automatic screw machine and turret lathe work.

The Company is prepared to recommend the composition giving the most efficient and satisfactory results when it is necessary to combine a forming or bending operation with that of cutting and threading.

Anaconda Publication B-14 sent upon request.

Anaconda Welding Rods—THE AMERICAN BRASS COMPANY has developed Anaconda Welding Rods in several different alloys, each with its individual characteristics particularly adapted to a certain class of work.

Tobin Bronze (Reg. U. S. Pat. Off.), an exclusive product of THE AMERICAN BRASS COMPANY, makes a most satisfactory rod for oxy-acetylene welding.

It melts at 1625° F. and flows freely at 1650° F., making joints 100% stronger than cast iron and approximating the strength of commercial steel welds.

Since best results are obtained with the base metal at a low, red heat, the customary preheating of broken castings and parts can usually be omitted, thus saving the time and expense incidental to dismantling, preheating and reassembling.

Shapes—Extruded—Drawn—Rolled—for Engineering Uses

Copper, brass and various special alloys suitable for engineering requirements are extruded, drawn or rolled in shapes which accurately follow the desired cross section. Metals thus treated are homogeneous, free from defects and have considerably higher physical properties than sand castings.

The use of Anaconda Extruded Shapes for architectural construction, railway and motor car fittings and for manufacturing electrical appliances and equipment, hardware, locks, etc., assures economy by reason of the small amount of machining necessary. Extruded, drawn or rolled shapes can be supplied cut up in lengths as short as ¼ in. and in mill lengths as long as required.

Die-Pressed Metals

THE AMERICAN BRASS COMPANY is equipped with special high pressure machinery for producing forged or pressed parts from a wide range of brass and bronze alloys as well as from leaded nickel silver. Extruded blanks of proper cubic measurement are used to insure homogeneity and high strength.

The use of Anaconda die-pressed parts eliminates much of the machining necessary when castings are used. Die-pressed parts are entirely free from sand and impurities, consequently cutting and turning tools last much longer, thereby increasing production.

Service, Facilities and Literature

THE AMERICAN BRASS COMPANY offers the co-operation of its Technical Department in determining the metal best suited to meet specific conditions.

Plants are located near large consuming centers to assure prompt and dependable service on copper, brass, bronze and nickel silver to all sections of the country.

Price lists and descriptive literature on request.

REPUBLIC STEEL CORPORATION

GENERAL OFFICES
YOUNGSTOWN, OHIO

DISTRICT SALES OFFICES

BIRMINGHAM, ALA.
BOSTON, MASS.
BUFFALO, N. Y.
CHICAGO, ILL.
CINCINNATI, OHIO

CLEVELAND, OHIO
DENVER, COLO.
DETROIT, MICH.
GRAND RAPIDS, MICH.

HOUSTON, TEX.
INDIANAPOLIS, IND.
LOS ANGELES, CAL.
MILWAUKEE, WIS.
NEW YORK, N. Y.

PHILADELPHIA, PA.
PITTSBURGH, PA.
ST. LOUIS, MO.
ST. PAUL, MINN.

SAN FRANCISCO, CAL.
SEATTLE, WASH.
TOLEDO, OHIO
TULSA, OKLA.
YOUNGSTOWN, OHIO

For Other Republic Products, see Manufacturers' Index

Products



"AGATHON" ALLOY STEELS.

CULVERTS: Toncan Iron and Steel Corrugated Culverts and Perforated Corrugated Drains; Sectional Plate Pipe.

DIE-ROLLED PRODUCTS.

PIPE: Black and Galvanized Steel, Copper Bearing Steel and Toncan Iron—*Standard, Extra Strong and Double Extra Strong*—Butt and Lap Welded; Electric Weld Pipe—Steel and Toncan Iron; Line, Drive, Tubing, Casing and Rotary Drill Pipe; Ammonia Pipe; Water Well Casing and Drive Pipe; Couplings.

PLATES: Steel, Toncan Iron and Enduro Stainless Steel.

RAIL STEEL PRODUCTS: Structural Shapes, Fence Posts and Assemblies; Butted and Electric Weld Tubing.

SHEETS: Plain and Corrugated—Hot and Cold Rolled—Blue Annealed, Black Sheets in all finishes, Pickled, Full Finished, Auto Body, Metal Furniture, Electrical, Enameling, Galvanized, Galvannealed, Long Ternes; Formed Roofing and Siding Products; Steel; Toncan Iron; Enduro Stainless Steel.

STRIP: Hot and Cold Rolled, Carbon, Alloy, Electrical, Toncan Iron and Enduro Stainless Steel.

STRUCTURAL SHAPES: Standard and Special Shapes, Concrete Reinforcing Bars.

TIN PLATE: Coke Tin Plate, Tin Mill Black, Tin Plate in Coils, Lacquered and Coated Plate in solid colors.

TUBING: Round, Square, Rectangular, Hexagonal, Helical, Oval and Ornamental Electric Welded Tubing in Steel, Toncan Iron, Enduro Stainless Steel and other ferrous alloys.

WIRE PRODUCTS: Wire Rods, Drawn Wire, Wire Nails, Tacks.

STEEL AND TUBES, INC.: Steeltubes Threadless Rigid Conduit, Electrunit Boiler Tubes, Electrunit Condenser Tubes.

UPSON DIVISION: Bolts, Nuts, Rivets, Turnbuckles, Headed and Threaded Products.

Republic Electric Weld Pipe, Casing and Tubing

A mechanically perfect pipe, made of open hearth steel, special alloy steel or Toncan Iron by a patented process controlled exclusively by REPUBLIC STEEL CORPORATION. Available in sizes 2½ in. to 16 in. o. d. Perfectly round, of uniform wall thickness, clean inside and outside, free from scale, and with a weld stronger by actual test than the wall. Ideal for many uses, including foundation work (piles, etc.). Since its introduction, only



three years ago, more than 7,000 miles of Republic Electric Weld Pipe has been placed in service. Write for literature.

Republic Copper Bearing Steel Pipe

Suggested for installations comparable to atmospheric corrosive conditions. Pure copper added to the steel provides

resistance to this type of corrosive attack. Works easily.

Republic Wrought Steel Pipe

Made from uniformly good quality soft weldable steel, rolled from solid ingots. Butt or lap welded. Threads, flanges and bends easily. Marked with the name "Republic" in raised letters. Couplings stamped "RS."

Agathon Alloy Steels

The lighter weight, greater strength and a greater resistance to impact and torsional strain made possible by Agathon Alloy Steels are meeting the unusual demands of many industries. Agathon Alloy Steels may be the solution to your problems.



Sil-Con Electrical Steels

Republic SIL-CON Electrical Steels are available in two forms—sheet and strip—both having the same chemical analysis and the same physical and electrical characteristics. Republic SIL-



CON Electrical Steels are guaranteed to meet specific requirements of electrical performance—high permeability, low core loss, low hysteresis loss. Both sheets and strip are uniform in size, gauge and temper, and are absolutely free from loose scale or tendency to flake scale during fabrication. They also possess superior

punching qualities. In seven grades—Armature, Electrical, Special Motor, Special Dynamo, Regular Transformer, Special Transformer, Extra Special Transformer.

Toncan Enameling Iron

Toncan Enameling Iron—in sheet form—is a highly refined iron especially processed for vitreous enameling. Uniform in composition and structure, free from segregated areas of inclusions, free from blisters and laminations, and with an open surface structure that affords a bulldog grip for the enamel. It is easy to form and draw. Available in gauges 10 to 26 inclusive, in a wide range of sizes.



Upton Division Products

Bolts, Nuts, Rivets, Turnbuckles and other headed and threaded products known for generations for quality of workmanship, dependability and uniformity.

Die-Rolled Products

Die-rolling answers the question of fast, economical production of duplicate parts formerly made by casting or forging. This process imparts great strength and rigidity, thus permitting decrease in weight with lower cost. Production possibilities are unlimited.

A trained engineering staff is at your disposal for adapting this process to your products.

Engineering Service and Detailed Information

Republic Engineers are always ready to make suggestions or offer assistance on any problem relating to the use of steel or steel products. Detailed information on any Republic product may be had from the General Offices or any District Sales Office.

ENDURO STAINLESS STEELS

A series of corrosion and heat-resisting alloys containing chromium, or chromium and nickel, of carefully adjusted compositions prepared especially for the applications for which such alloys are now recognized as suitable. They are produced in all standard commercial forms—in sheets (both pickled and polished finishes), plates, bars (centerless ground and cold drawn), rounds, squares, hexagons, flats, wire, cold rolled strip, seamless and welded tubing, and, through fabricators, in castings, forgings, bolts and nuts, screws, nails, tacks, etc.



*Licensed under Chemical Foundation Patents,
Nos. 1316817 and 1339378*

Advantages of Enduro

Because of its exceptional resistance to corrosion, oxidation, and scaling at high temperatures, this remarkable metal finds many uses in all branches of industry.

ENDURO is resistant to air, water and most acids at high and low temperatures. It is impervious to nitric acid in any concentration. It is highly resistant to sulphur compounds found in crude oils, and because of this property, plus its high maintenance of strength at elevated temperatures, it is an indispensable material in the oil refining industry. Its resistance to sulphurous acid has made it the superior material for use in the paper and pulp industry.

It is immune to food and fruit juices, hot or cold. It is completely resistant to discoloration or corrosive attack from all dairy products. It cannot contaminate nor impart metallic flavors to foods with which it comes in contact. It is non-porous, clean, safe and sanitary.

ENDURO resists corrosion, erosion, abrasion and oxidation. It does not embrittle at high temperatures. It possesses high creep strength. It is tough and strong, but workable without difficulty. It can be deep drawn, wire drawn, spun, bent, tapped, threaded, flanged, stamped, soldered and welded.

ENDURO will not chip, crack or wear off, for it is the same wonderful metal all the way through. It polishes to a mirror finish. Its lustre is permanent. It is easy to clean and keep clean.

Popular Enduro Stainless Alloys

Enduro 18-8—The most popular and widely used of the ENDURO Stainless Alloys. Contains 18% chromium and 8% nickel with carbon under 0.16%. Possesses extraordinary toughness, high creep strength and ductility. It is non-magnetic and, being an austenitic alloy, it is incapable of heat treatment. Suitable for temperature service to 1600° F.

Enduro 18-8-S—Similar to 18-8, but with carbon under 0.07%. For applications requiring high physical properties above 1000° F., and for welded fabrication where subsequent heat treatment is not possible.

Enduro 18-8-B—Similar to 18-8, but with added silicon. Oxidation resistance to 1700° F.

Enduro S—Contains 13% chromium with carbon under 0.12%. Suitable for applications where moderate corrosion resistance combined with high strength and toughness are required. Oxidation resistance to 1500° F.

Enduro AA—Contains 17% chromium with carbon under 0.10%. For applications where corrosion resistance takes precedence over high strength or toughness.

Enduro HC—Contains 28% chromium with carbon under 0.20%. For high temperature corrosive applications where high strength and toughness are not required. Oxidation resistance to 2100° F. Highly resistant to sulphur gases, hot or cold.

Enduro HCN—Contains 23% chromium and 12% nickel with carbon under 0.20%. For applications requiring heat resistance and high strength. Oxidation resistance to 2000° F.

Enduro NC-3—Contains 25% chromium and 20% nickel with carbon under 0.20%. For applications requiring highest strength and oxidation resistance at highest temperatures.

Other Alloys—In all there are fifteen ENDURO heat and corrosion-resisting alloys, with varying ranges of chromium content, and with or without the alloy addition of nickel, molybdenum, tungsten and other elements. This range permits the selection of the most economical type to meet specific conditions of wet or dry corrosion, elevated temperatures, strength, impact resistance, or required working qualities such as drawing, welding and machining.

Applications

ENDURO has met with conspicuous success in thousands of types of installations. Space here permits the listing of only a very few by industries. Architectural and Building applications; Automobile Parts and Trim; Bottling Machinery; Brewing and Beer-Dispensing Equipment; Canning and Preserving Equipment; Chemical Plant Equipment; Dairy and Ice Cream Equipment; Furnace Parts; Hospital Equipment; Household Appliances; Marine Equipment; Mining Machinery; Oil Refinery Equipment; Packing House Equipment; Paper and Pulp Machinery; Railroad Equipment; Restaurant, Hotel and Cafeteria Equipment; Rubber Plant Machinery; Sugar Refining Machinery.

Literature

A comprehensive series of booklets has been prepared on the ENDURO Stainless Alloys, containing analysis, physical properties, creep strength, instructions for working and other basic facts concerning the various types of ENDURO. Your files will be more complete with this set of booklets. Write for them.

Metallurgical and Engineering Service

The facilities of one of the largest and best equipped laboratories in America, together with the experience and skill of a trained corps of Metallurgists and Engineers, are at your service in working out any problem relating to the use or fabrication of ENDURO. Tell us your problems.

Distributors and Fabricators

ENDURO Distributors and Fabricators are located in all large cities throughout the country. In addition, equipment of ENDURO Stainless Steel is now being made by leading manufacturers for all types of service. Let us send you full details.

THE INTERNATIONAL NICKEL COMPANY, INC.

Producers of Monel Metal and Nickel

67 Wall Street, NEW YORK, N. Y.

MINES AND SMELTER: COPPER CLIFF, ONT., CANADA

ROLLING MILL: HUNTINGTON, W. VA.

REFINERY: PORT COLBORNE, ONT., CANADA

Products

*MONEL METAL and NICKEL:

Rod, Hot Rolled	Shot	Bolts
Rod, Cold Drawn	Ingot (pig)	Nuts
Sheet, Full Finished	Castings	Rivets
Sheet, Cold Rolled	Forgings	Washers
Plate	Strip	
Tubing	Angles	

**INCONEL (Nickel-Chromium Alloy):

Sheets Rods Tubes Wire

EVERWRITE (Nickel-Copper-Iron Alloy):
Blocks for casting only (No rolled forms)

NICKEL:

Electrolytic Nickel	Mond Pellets
Electrolytic Nickel (cut)	Mond Fines
Electro Squares	"F" Nickel Ingots
Nickel Ingots (remelted electro)	"F" Nickel Shot
"C" Nickel Ingots (casting grade)	Green Nickel Oxide
Nickel Shot (remelted electro)	Black Nickel Oxide
	Reduced Nickel Oxide
	N. C. C. Pig (Nickel-Copper-Chromium)



General Characteristics—Monel Metal is tough, ductile and takes and retains a high finish. It can be machined, cast, forged, rolled, drawn, brazed, annealed, polished, soldered and welded.

Uses of Monel Metal in the Power Plant

Pumps: Rods, valves, liners, plungers, bushings, shafts, cylinders, impellers, gland-studs, nuts, springs, etc.

Valves: Seats, stems, disks, plungers, disk rings, seat rings, plugs, wedges, spindles, needles, bushings and dashpots.

Steam Turbines: Blades, binding wires, shroud, valve trim, garter springs, etc.

Other typical uses for Monel Metal in power plant equipment include ball valves, diaphragms, gaskets, meter gears, impellers, needles, nozzles, orifice plates, shafts, spindles, springs, studs and similar parts exposed to severe service.

Other Industrial Uses of Monel Metal

Filter cloth, screens, centrifugal liners, agitators and shafts, tie rods, bolts, nuts, washers, lag screws, kettles, trays for shelf dryers, crystallizing pans, tubing for evaporators, concentrators and stills and linings for chemical equipment in chemical plants, tanneries, dye-houses, bleacheries, etc.

Glass plant machinery.

Screens, chutes and machinery for coal mines.

Rolls, castings, valves, cylinder wire, etc., for pulp and paper mills.

Filling machines, tanks, etc., for pharmaceutical, chemical and food products.

Pins, crates, plungers, tie rods, tanks, frames, etc., used in pickling steel, etc.

Homogenizers, tanks, freezer parts, hoppers, conveyors, evaporators, cream separators, milking machines, etc., for dairies, etc.

Textile and laundry machinery and accessories.

Refrigerating machine parts and refrigerating trim.

Food handling equipment where materials come in contact with food acids, fruit juices, brine, etc., for food product establishments and packing houses.

Hotel, restaurant, hospital and institution kitchen equipment.

Propellers, sheathing, propeller shafts, rudders, trim, deck fittings, etc., for marine work.

Fabricated Forms of Nickel

Nickel, in its rolled and fabricated forms, is extensively used in the chemical industry for fusion pots, kettles, stills, tubing, etc. Because of its resistance to oxidation at elevated temperatures rolled nickel is used for ignition points and tubes, spark plug wire, annealing boxes, burner parts, fire brick anchor bolts, etc.

Inconel

Inconel is a nickel alloy containing approximately 14% of chromium. Its normal physical characteristics are somewhat higher than either Monel Metal or pure nickel. Accordingly it has good versatile engineering properties with excellent corrosion resistance, retention of strength at high temperatures, and super-stainlessness.

New literature on Inconel is now available.

Technical Research and Service

Information acquired as the result of many years of nickel alloy development experience has qualified our technical staff to assist in the selection of suitable materials for a wide range of industrial applications. They will be glad to co-operate in the development of any new applications of Monel Metal, Nickel and Nickel Alloys to help in the extension of present uses. Also assist in problems of heat treatment, equal in importance to the selection of the materials themselves.

Technical Data

Engineering data on Monel Metal and Nickel is given in great detail in the U. S. Bureau of Standards "Circular 100" and in Kent's Handbook of Mechanical Engineering; also in Bulletin T-5 on "Engineering Properties of Monel Metal" (published by THE INTERNATIONAL NICKEL COMPANY, INC.)

Literature

The properties and more important applications of Monel Metal, Inconel, Nickel and Nickel Alloys are interestingly described in bulletins which will be gladly mailed on request. Send for *List of Publications on Monel Metal and Rolled Nickel* or *List of Publications on Nickel and Its Alloys*.

Properties of Monel Metal

Combining high mechanical properties with excellent resistance to corrosion, Monel Metal is a "general purpose" rather than a "specialized" alloy. It is characterized by stability of properties in service and by their insensitiveness to the operations of manufacture and fabrication.

Due largely to the simple and homogeneous character of its internal structure, its performance is not adversely affected by cold working, by welding, by casting or by heat treatment.

Strength at High Temperatures—At 70° F., Monel Metal has a tensile strength of 80,000 to 90,000 lbs. per sq. in. and an elastic limit of 50,000 to 60,000 lbs. At high temperatures a large percentage of this strength is retained by Monel Metal. At 700° F., as compared with 70° F., for example, Monel Metal retains 74% of its elastic limit and 85% of its tensile strength.

Resistance to Corrosion—Monel Metal successfully resists the corrosive action of hot gases, saline solutions, gasoline and mineral oils, alcoholic and other liquids, and of most acids. It will not rust.

Resistance to Wear—Monel Metal has exceptional resistance to abrasion. Even under the continuous cutting action of steam at high superheat, Monel Metal shows little or no wear after long service.

Coefficient of Expansion—Monel Metal has a coefficient of expansion nearly the same as steel. Parts made of Monel Metal and supported by steel, therefore, when subjected to extreme changes of temperature, retain indefinitely their proportional size and shape.

*Monel Metal is a registered trade-mark applied to a technically controlled nickel-copper alloy of high nickel content. Monel Metal is mined, smelted, refined, rolled and marketed solely by International Nickel.

**Inconel is a registered trade mark applied to a nickel alloy containing chromium, refined and marketed solely by International Nickel.

LYON METAL PRODUCTS, INCORPORATED

Manufacturers of Sheet and Angle Steel Products Designed and Built to Meet Specific Requirements

1833 Madison Avenue
AURORA, ILL.

SALES OFFICES IN ALL PRINCIPAL CITIES

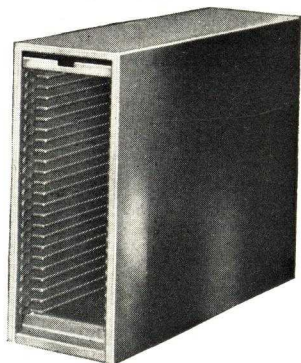
Standard Products

Contract Work: SPECIAL CABINETS, CASES, DISPLAY STANDS, RACKS, MERCHANDISING UNITS and FABRICATED SHEET METAL PARTS for your product.

Storage Equipment: SHELVING, LOCKERS, CABINETS, TOOLROOM SHELVING, PIPE and ROD RACKS, SHELF BOXES, MATERIAL BINS, BOOKSTACKS.

Shop Equipment: BOXES, BENCHES, TOOL STANDS and CABINETS, TABLES, FOLDING STEEL CHAIRS, ENCLOSURE PANELS.

Store Fixtures: WALL SHELVING, COUNTERS, SHOW CASES, DISPLAY STANDS.

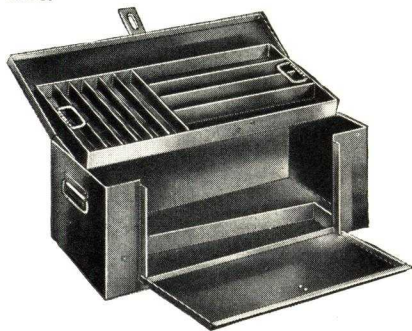


Cases and Cabinets

Service and supply cabinets are furnished with a great many products, especially office machines and automotive testing and servicing devices. Other types of equipment require enclosure cases similar to the Card Index Case illustrated.

Special Stands and Tables

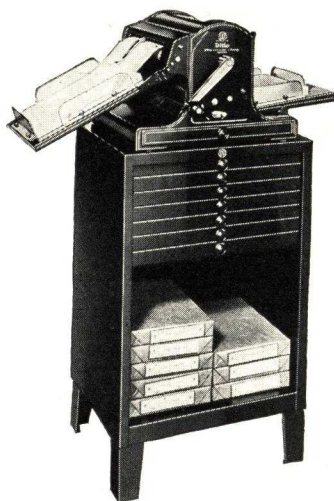
If a special stand or table is required for your product, or if you wish suggestions in redesigning your present stand, Lyon will cooperate in developing a design that is both attractive and economical to manufacture.



Contract Work

Lyon Engineers are prepared to assist in designing or redesigning for more economical production, cabinets, cases, stands and fabricated sheet metal parts for your product. Our manufacturing experience extends over a period of thirty-two years and includes the production of a wide variety of steel equipment.

Arrange for our local representative to call—he will be glad to discuss your problems without obligation.

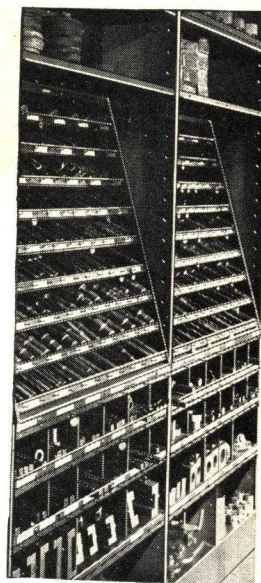


Containers

Steel containers for tool sets, small parts, accessories, springs, etc., built of steel, last for years and are attractive, efficient and economical. The tool box illustrated is an example of the type of container that sells a manufacturer's product.

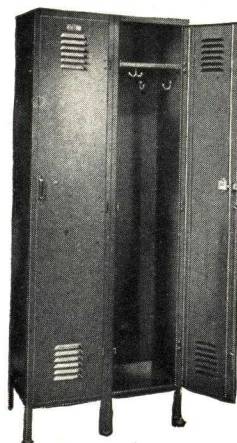
Tool Room Equipment

A complete line of units designed for the efficient storage of drills, taps, reamers, jigs, dies, milling cutters, lathe dogs and gauges. Permits storage of valuable tools in an accessible and safe manner with every item visible. All equipment specially adapted for use with any type of record keeping. Send for catalog No. 105-C.



Storage Shelving

Adjustable steel shelving designed to accommodate the maximum of material in a minimum of floor area. Available in every desirable width, height and depth. All parts rigidly constructed to give years of service, and all parts are interchangeable. Finished with a durable enamel, baked on. Send for catalog No. 118.

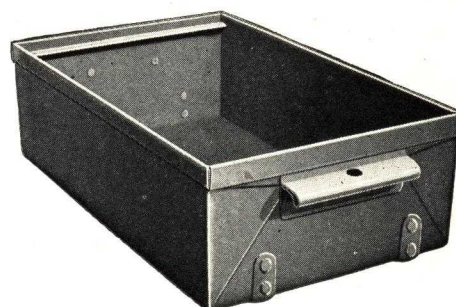


Steel Lockers

For every office, factory and institution use. For clothing, tools and supplies in locker rooms, wash rooms, gymnasiums, and for departmental requirements. Built to give continuous trouble-free service, with welded angle steel frame, sturdy door and exceptionally strong hinges. Finished with a durable baked enamel finish. Send for catalog No. 209-G.

Steel Boxes

A Lyon steel box is available for every production, storage or assembly requirement. Special boxes for conveyor systems, order assembly, stockroom and manufacturing department—with skids, adjustable dividers, or for stacking or nesting. Catalog No. 611 illustrates all types from light weight boxes for light loads to heavy reinforced tote boxes for castings, machine parts and heavy material.



B. F. GUMP CO.

Flour, Feed, Cereal Mill and Dry Chemical Plant Equipment
Grinding, Bolting, Blending and Packing

449-457 South Clinton Street, CHICAGO, ILL.

Draver Measuring Feeders

Draver Feeders are made in various sizes to handle from $\frac{1}{2}$ oz. to 3 lbs. per minute and up to 1000 cu. ft. per hour, and in various styles to handle practically every type of material.

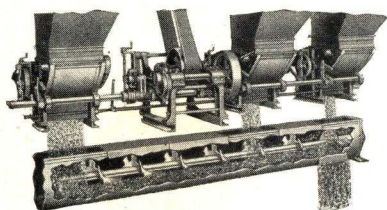
Draver "AA" Heavy Duty Feeders

Designed especially for accurate and positive blending of two or more ingredients into uniform finished products, Draver



Feeders are the most important part of continuous mixing systems. Accurate to within one-half of one per cent, they will feed correct proportions of any dry powdered or granular materials.

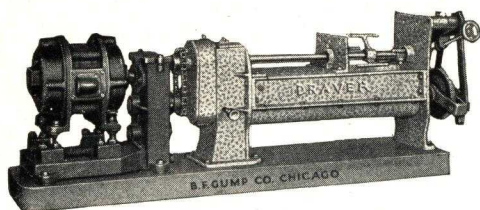
Draver Master Drive—With the *Master Drive*, from 2 to 25 feeders can be operated with only one belt, this driving the master drive, which in turn imparts the power to each indi-



vidual feeder through the patented rocker shaft. This does away with the various belts or chains necessary with other methods of driving feeders, and eliminates inaccuracy due to belt slippage.

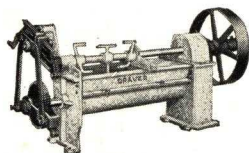
Draver Style "JJ" Chemical Feeder

The "JJ" Draver Chemical Feeder has a capacity range of from one-fifth to seventeen cubic feet per hour. It is especially

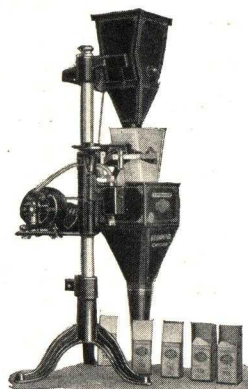


adapted for adding salts, phosphates, etc., to chemical formulas, where accuracy and economy in operation are required. Highly recommended for feeding lime, etc., to dust collecting and fume conducting systems for the counteracting of sulphuric and other acid fumes.

Draver Style "K" Chemical Feeder



The Style "K" Feeder is capable of accurately feeding very small quantities of such materials as salt, soda, phosphate, lime, starch, sugar, etc., in quantities from $\frac{1}{2}$ oz. to 3 lbs. per minute. All parts coming into contact with the material being fed are constructed either of phosphor bronze or galvanized iron.

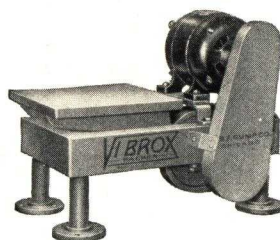


Edtbauer Automatic Weighers

More accurate and three times faster than hand weighing, this single compartment weigher speeds up production and reduces overweight losses to a minimum. A motor is necessary only when the material being weighed will not flow freely through the feed hopper. Made in five sizes. Simple construction and few working parts insure accuracy and long service.

Nos. 0 and A0.....	1 to 8 oz.
Nos. 1 and A1.....	$\frac{1}{4}$ to 2 $\frac{1}{2}$ lbs.
Nos. 2 and A2.....	$\frac{1}{2}$ to 5 lbs.
Nos. 3 and A3.....	5 to 15 lbs.
Nos. 4 and A4.....	10 to 50 lbs.
Nos. 5 and A5.....	40 to 100 lbs.

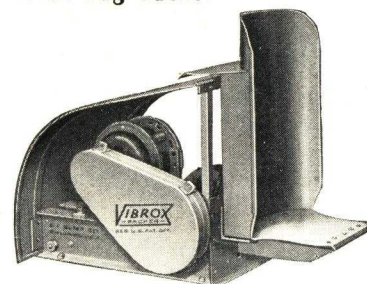
No. 10M Vibrox Container Packer



Made in two sizes for packing small containers and kegs, from 5 to 25 pounds, and from 25 to 75 pounds when filled; requires only a fractional horse power motor for operating, and reduces packing expenses by speeding up production and packing more material in the same size containers. Also furnished for packing bags containing same weights.

No. 35M Vibrox Bag Packer

Has a continuous, silent, quick oscillating motion, shaking and compacting the material as it flows into the bag from automatic scale or spout. The chief features are the saving in labor and bag material, making it possible to reduce the size of the bag for the same amount of material being packed.



Length over all.....	43 in.
Width over all.....	24 in.
Height over all.....	33 in.
Hp. required.....	1 Hp.
Capacity, bags.....	80 to 150 lbs.

No. 40M Vibrox Barrel Packer

The Vibrox will silently pack any dry material that will compact of its own weight when submitted to an oscillating, rocking or vibrating motion. With the Vibrox, packing will be done faster and better and at a saving of one-third or more on packing costs. It will also be possible to put 15% to 30% more material in the same size container.



The Vibrox is free from starting and stopping clutches, levers, and mechanical attachments that need frequent adjustments and repairs.

Length over all.....	28 in.
Width over all.....	23 in.
Maximum diameter barrel head.....	22 in.
Approximate horsepower required.....	1
Capacity filled barrel.....	up to 750 lb.

THE KRON CO.

Industrial Scales of All Types and Capacities

BRIDGEPORT, CONN.

BRANCHES IN PRINCIPAL CITIES

KRON

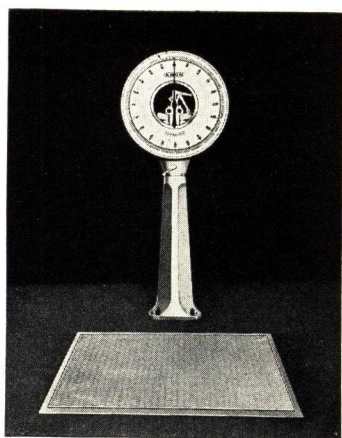
SPRINGLESS—ACCURATE SCALES

"The Kronweigh"

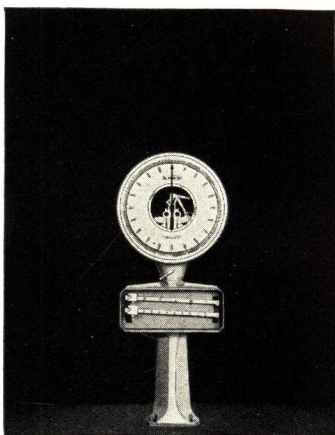
The improved Kron Springless Dial Scales are the culmination of 25 years of dial scale manufacturing experience. They represent the fulfillment of an ideal—to produce an industrial dial scale that cannot be equalled for distinctive appearance, ruggedness, and above all durable accuracy.

If you wish to reduce your costs, speed up your weighing and put it on a practical, efficient, economical basis—then let the Kron Scale engineers study your problems.

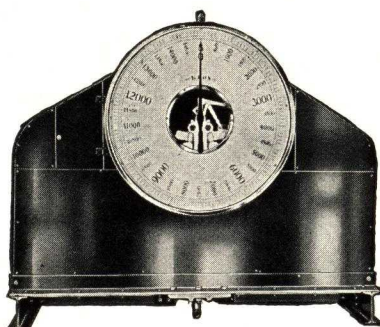
Bulletins describing the many Kron features gladly furnished on request.



Kron Dormant Platform Scale



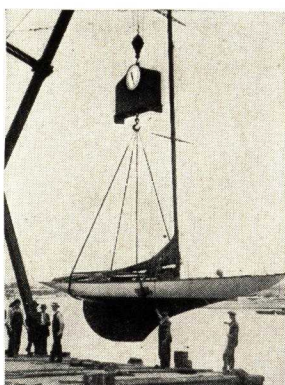
Kron Attachment for Converting Any Beam Scale to a Dial Scale



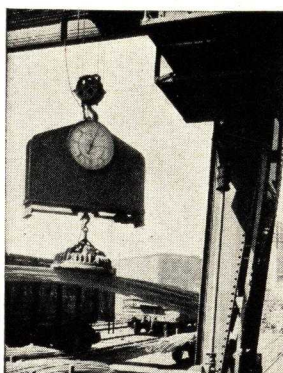
Kron Crane Scale



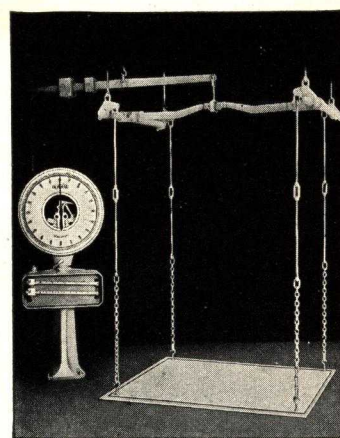
Kron Portable Platform Scale



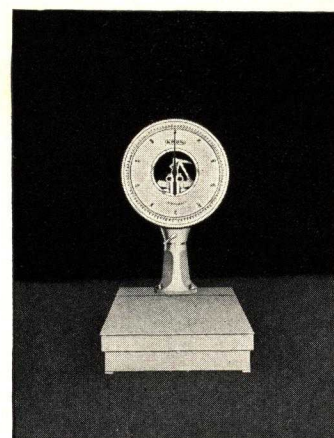
Weighing Yacht



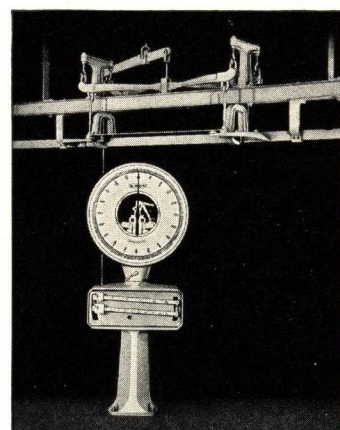
Handling Rods with a Magnet



Kron Pitless Suspension Scale



Kron Bench Scale



Kron Track Scale

CENTRIFIX CORPORATION

Purifying and Separating Equipment for Steam, Vapor, Gas and Air

3033 Prospect Avenue, CLEVELAND, OHIO

Centrifix Purifiers and Separators

Centrifix separates liquid and solid entrainment from moving steam, gases and vapors. Efficiency of removal is exceptionally high—up to 100%—according to character of substance to be recovered. There are no moving parts, operation is continuous without cleaning or maintenance. Design and metals to suit each installation. Bulletins containing complete description and specifications of each type available upon request.

Centrifix

PURIFYING EQUIPMENT for STEAM—VAPOR—GAS—AIR

Advantages

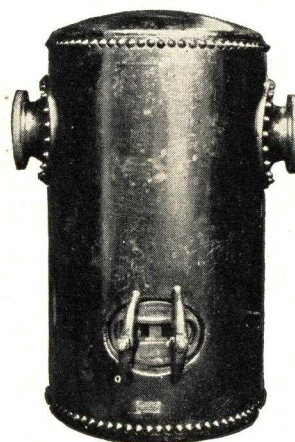
- High separating efficiency
- Broad operating range
- Negligible pressure drop
- Self-cleaning, no maintenance
- Permanent metals, no corrosion
- Small size, light weight
- No parts to go adrift
- Vortex action prevented by vortex cone
- Simple installation

Centrifix Products

Centrifix Purifiers are available in the following standard units, each of which separates and purifies through centrifugal action. A whirling motion is imparted to the carrier by passing it through a set of fixed ture blades. The centrifugal force thus generated collects the entrainment, which is discharged through suitable outlets. Operation is effective at any pressure or velocity.

Steam Purifier: Internal Boiler Style, Type FD—Insures against priming and slugging; delivers clean bone-dry steam to prime movers; prevents deposits in superheater tubes; increases superheat temperatures; improves entire steam plant efficiency. Located at outlet in steam drum. Up-flow or down-flow type, fits standard outlet sizes. Ejects may be returned to boiler or trapped outside as dictated by problem encountered.

Line Purifier, Type RL—Removes moisture, oil and solids from steam. Located between steam drum and superheater, ahead of prime movers and auxiliaries, on process lines, etc.; standard pipe sizes 1-in. to 12-in., working pressures up to 600 lbs.



Type R Receiver Separator

Exhaust Purifier, Type RW—Removes oil, water and other impurities from exhaust steam lines, permitting direct return of condensate to boiler. Made in all standard pipe sizes from 12-in. up. For smaller sizes specify Type RL.

Oil Separator—Centrifix Purifiers are extremely efficient in removal of oil from high pressure or exhaust steam. Furnished in all standard pipe sizes.

Receiver Separator, Type R—Steel drum with Centrifix Internal Purifier at outlet. Double separation, by impact and by Centrifix structure. Large capacity to handle slugs. Made for all standard pipe sizes and to fit any piping lay-out.

Dust Separator for Gas Lines, Type RLD—Removes dust from natural gas lines, to prevent cutting of valves and fittings, slowing of meters and clogging of pilot lights. Sizes from 4 to 12-in., pressures to 1200 lbs.

Line Purifier for Gas, Type RL—Removes water, tar, soot and oil from producer, retort and by-product gas.

Installed at gas well ahead of regulating valve will recover oil, water and other entrainment. All standard pipe sizes and all pressures.

Gas Scrubber—Thoroughly scrubs and cleans gases, removing dust, oil, tar and moisture. Kerosene, gas, oil, water or other liquid used as scrubbing medium. All sizes and capacities.

Compressed Air Cleaner, Type RD—Removes moisture, oil and sediment from compressed air lines. Located ahead of air tools, paint sprays, sand blasts—wherever clean dry air is necessary. Prevents freezing of outside lines. Standard sizes from 1/4-in. up.

Suction Intake Purifier, Type S—Installed on intake of compressors, gas engines, blowers, and fans, to remove dust and moisture. Self-cleaning. Dust pocket may be emptied during operation. Hooded for outdoor use. In standard pipe sizes 4-in. to 24-in.

Evaporator Purifiers, Type FE—Used in industrial evaporators, distilling apparatus, etc., preventing entrained liquids from going over with vapor. Operate under extremely high velocities common to vacuum processes. Suitable for sugar, corn and malt syrups, salt, alkali, glycerine, feedwater evaporators, etc. Metals to suit. Sizes 4-in. to 42-in.

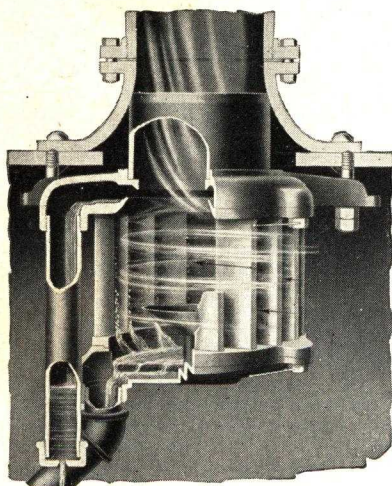
Ammonia and Carbon Dioxide Separator—Type RL Line Purifier or Type RD Compressed Air Cleaner will recover oil and other entrainment from ammonia, carbon dioxide and other gases. All standard pipe sizes.



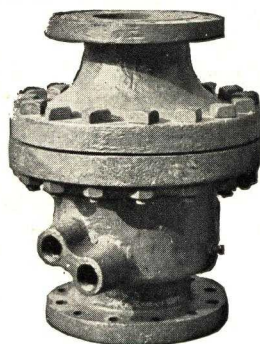
Compressed Air Cleaner



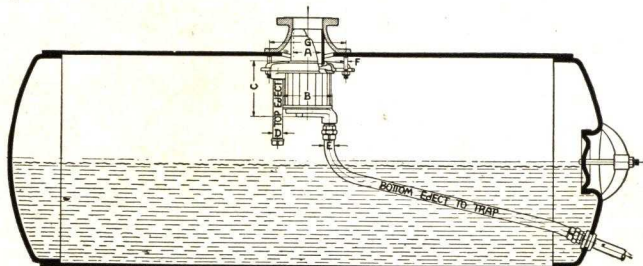
Suction Intake Purifier



Type FD Internal Purifier



Type RL Line Purifier



Method of Installing Internal Purifier in Steam Drum

All Centrifix products are protected by United States and foreign patents, both granted and pending.

THE SERVICE RECORDER COMPANY

A Production Recorder for All Types of Machinery

468 Hanna Building, CLEVELAND, OHIO

The Servis Recorder

What It Does—A "productiveness" recorder that automatically produces, on a printed chart, a graphic record showing exactly when and for what periods a given machine has been in operation or standing idle.

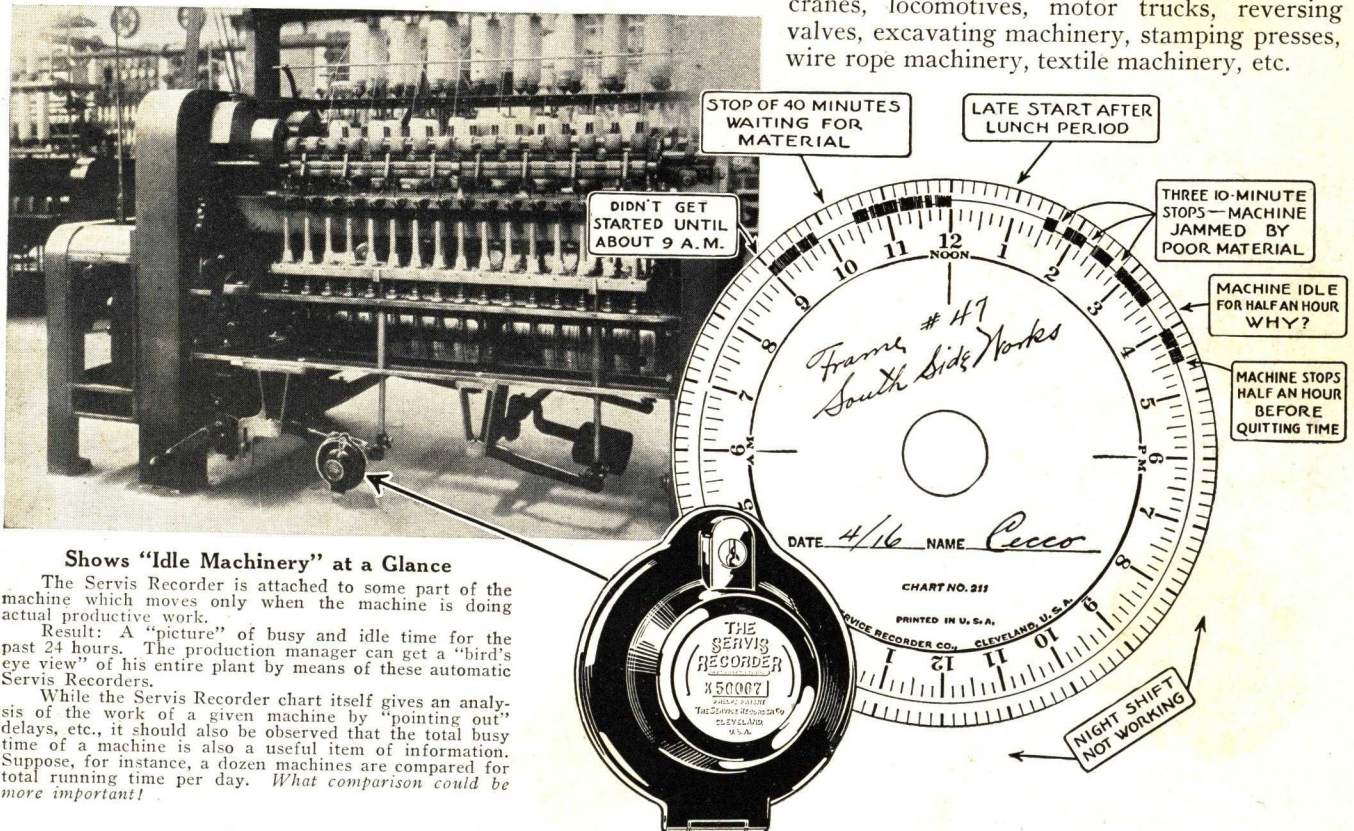
What It Is—A device similar to the ordinary pedometer, actuated by any rotary or eccentric motion, if not too rapid.

Instead of the pendulum being connected to a train of gears, as in the pedometer, it operates a sapphire

point stylus which marks the clock-controlled graphic chart by scraping off a wax coating on the chart and exposing a deep red color.

How It Is Installed—The small compact metal case is simply bolted or clamped to any machinery or truck and then locked until the record of moving and idle periods of the machine in question is required. It is not geared up with anything; in fact, the Servis Recorder is entirely self-enclosed and has no outside connections.

Some Uses—On production machinery of all kinds: cranes, locomotives, motor trucks, reversing valves, excavating machinery, stamping presses, wire rope machinery, textile machinery, etc.



Shows "Idle Machinery" at a Glance

The Servis Recorder is attached to some part of the machine which moves only when the machine is doing actual productive work.

Result: A "picture" of busy and idle time for the past 24 hours. The production manager can get a "bird's eye view" of his entire plant by means of these automatic Servis Recorders.

While the Servis Recorder chart itself gives an analysis of the work of a given machine by "pointing out" delays, etc., it should also be observed that the total busy time of a machine is also a useful item of information. Suppose, for instance, a dozen machines are compared for total running time per day. What comparison could be more important!

THE SAME SERVICE RECORDER IS USED ON MOTOR TRUCKS

Tells Every Move the Truck Makes

Motor trucks everywhere, more than 80,000 of them at the end of 1932, were equipped with this same little *Servis Recorder*. It gives the same all-important information—busy time and idle time.

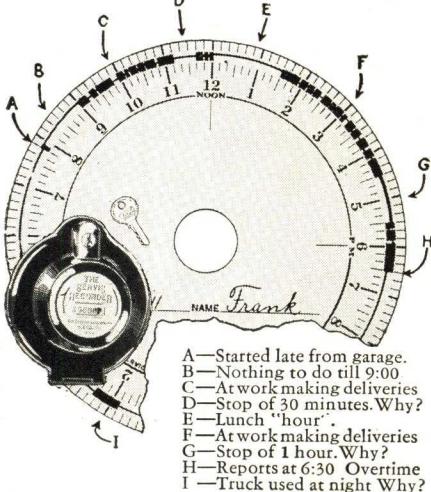
How the Servis Recorder Works on a Truck

It is operated by the sidesway that is present in every moving vehicle. In a train, notice how the bell-rope constantly swings from side to side. In a street car passengers have to hang on to straps. It is this force and this alone that is employed to swing the pendulum which, by means of a stylus, marks the chart.

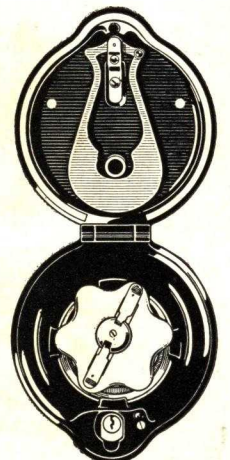
Simple Attachment—Because of this simple principle of operation, the attachment also becomes simple—merely a couple of screws to the truck body. You could even nail it on and it would work.

Save \$500 per Truck per Year—By eliminating only half an hour avoidable idle time per day.

On Industrial Trucks—Servis Recorders are equally effective.



Typical Chart "Made by a Motor Truck"



Servis Recorder Opened

A clock that turns a time chart and a "swinging" stylus that marks it

